INTEGRATED ASSESSMENT
(PRELIMINARY ASSESSMENT EQUIVALENT)
BASF CORP
U.S. EPA ID:IND026735506
WARSAW, INDIANA
KOSCIUSKO COUNTY

MARCH 3, 1995

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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Site Investigation Section
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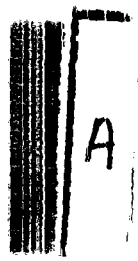
Approved By: for Jeanne Griffin Date: 7/24/96
Jan Pels, EPA Site Assessment Manager

1272

BASF Corporation

TABLE OF CONTENTS


A

BASF Corporation

INTRODUCTION

The Indiana Department of Environmental Management (IDEM), Office of Environmental Response (OER), Site Investigation Section, under a Cooperative Agreement (CA) with the United States Environmental Protection Agency (U.S. EPA), Region V Office, has been funded to perform Integrated Assessments for sites listed in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). These assessments are conducted under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986. The purpose of the investigation is to obtain the data necessary to identify the highest priority sites posing threats to human health and the environment.

The Integrated Site Assessment was created under the guidance of the Superfund Accelerated Cleanup Model (SACM). One of the two primary objectives of SACM is to minimize the sequential and redundant assessments of hazardous waste sites. The concept of the Integrated Assessment was developed to provide a means to conduct a single assessment process for removal, pre-remedial and remedial concerns. The Integrated Assessment will replace the traditional assessments, Preliminary Assessments and Screening Site Inspections, previously conducted under CERCLA.

SITE DESCRIPTION, OPERATIONAL HISTORY and WASTE CHARACTERISTICS

Site Description

The BASF Corp. site is located at 3025 Old Road 30 West, Warsaw, Kosciusco County, Indiana (See Figures 1 and 2). The facility consists of a single manufacturing and storage building, an outdoor tank farm for toluene and resonate storage, and an outdoor truck loading station. The facility is located in a predominantly rural area west of the City of Warsaw, and can be found immediately to the west of RR Donnelley & Sons Co., which owns the BASF facility and its assets (Reference 1). The Tippecanoe River is approximately .5 miles north and northwest of the facility.

The site's geographic coordinates are 41°14'36.62" N latitude and 85°54'03.82" W longitude (Reference 2). To reach the site, take SR 25 into Warsaw, go left (north) at fork, which becomes Center Street. Go north on Lake Street, which becomes Old Road 30. BASF is located approximately 2 miles west of Warsaw on Old Road 30 on the south side of the road.

Operational History and Waste Characteristics

BASF is an active facility which manufactures gravure publication ink using toluene, dry resin, or resonate solution and pigment.

The finished product is usually piped directly to the neighboring RR Donnelley facility. Occasionally, ink is transported in tanker trucks to RR Donnelley's other plants, but RR Donnelley is BASF's only customer. BASF has been operating the facility since 1985, when they bought the contract to manufacture ink for RR Donnelley from Inmont Corporation. Facility operations began in 1981 under Inmont (Reference 1).

At the time of a 1992 Indiana Department of Environmental Management (IDEM) inspection, BASF was not generating or handling hazardous waste. The facility does have current, special waste permits for the disposal of nonhazardous spent ink filters at four different landfills in Indiana (Reference 1).

On November 30, 1989, BASF notified IDEM's Emergency Response Branch that workers had identified soil contaminated with toluene while digging holes for compaction tests near the three above-ground toluene storage tanks on the east side of the BASF building. Toluene odors were noted four to five feet deep in two of the holes. The contamination was detected and the chemical identified by the smell, not by chemical sampling. BASF indicated that they would be hiring environmental consultants for site characterization and remediation (References 3 and 4).

BASF hired ATEC Environmental Consultants (ATEC), which performed a two-phase site investigation. The first round of sampling was conducted in January 1990, and consisted of eight soil borings, three of which were completed as monitoring wells (See Figure 3). The monitoring well borings were drilled to a depth of 13 feet, and the remaining soil borings were 7.5 - 8.0 feet deep. The water table was observed to be five to six feet below ground surface. One soil sample was collected from each boring and a groundwater sample was taken from each of the three completed wells. All samples were analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX) (Reference 5).

The highest total BTEX concentration in soil was 183.1 ppm at location B-4 (3.5-5.0 feet). BTEX was detected at other soil sampling locations at concentrations ranging from 0.02 ppm to 37.2 ppm. In groundwater, toluene was detected in all three wells, but at levels below the instrument quantitation limit of 5 ppb. Benzene, ethyl benzene and xylenes were not detected in groundwater (Reference 5).

The second phase of sampling conducted by ATEC took place in May 1990. Six additional soil borings, including two which were completed as monitoring wells, were installed at the site (See Figure 4). Two borings were completed to a depth of 5 feet, two were completed to 10 feet, and the two monitoring well borings were advanced to 12 and 13 feet. One soil sample was collected from each boring and a groundwater sample was collected from each new well. After the analytical results were received, one monitoring well (MW-4) was sampled again to confirm the result. Soil and groundwater samples were analyzed for benzene, toluene,

ethyl benzene and xylenes (Reference 6).

The maximum total BTEX concentration detected in soil was 2146.0 ppm at location B-8 (6.0-7.5 ft). Concentrations at other locations ranged from non-detect to 19.64 ppm. In groundwater, total BTEX was detected at MW-4 at a concentration of 83.4 ppm (toluene was 81.0 ppm) and at MW-5 with a concentration of .009 ppm (all toluene). The second sample from MW-4 contained a total BTEX concentration of 27.06 ppm (toluene was 26.0 ppm). Based on the results of both sampling events, soil contamination appears to be concentrated immediately to the east and slightly north of the above-ground storage tanks, and groundwater contamination appears to be centered around MW-4 (Reference 6).

The source of the contamination is uncertain. One possibility is a release of toluene based solvent during painting of the above-ground storage tanks in the 1980s (Reference 7 and 8). The tanks located adjacent to the contaminated area contain toluene, but BASF ruled these out as a source because no evidence of leaks was observed. Another theory was that the process vents attached to the BASF building, which discharged process solvent used inside the plant as a vapor, may have also expelled liquid organics which contaminated the soil. In late 1989, this procedure was discontinued. However, BASF no longer believes that this was the source (Reference 8).

In April 1991 Heritage Remediation/Engineering, Inc. conducted slug/recovery tests on each well, a soil vapor survey, and groundwater sampling. Slug/recovery tests were performed to obtain information useful to the design of a groundwater pumping system. Results of these tests showed hydraulic conductivities in most wells around 3.0×10^{-2} ft/min. MW-5 indicated a hydraulic conductivity of an order of magnitude lower at 1.36×10^{-3} ft/min. The soil vapor survey was inconclusive because of the high water table and the presence of water in the pore spaces which apparently restricted vapor movement (Reference 7).

Groundwater samples were collected from the five wells installed during previous investigations and were analyzed for benzene, ethyl benzene, toluene and xylenes. MW-4 had a total BTEX concentration of 56.8 ppm, with toluene detected at 55.9 ppm. Toluene was also found in MW-3 at a concentration of 0.014 ppm. BTEX were not detected in the other wells sampled (Reference 7).

BASF sent a letter to IDEM dated August 21, 1991 which outlined its proposed remediation plan. The proposal included extraction of groundwater from MW-4, treatment of groundwater using activated carbon, and discharge of treated groundwater back to the ground surface. Periodic sampling of groundwater and soil would be performed to determine the success of the system. The letter requested approval from IDEM (Reference 9). According to BASF, the IDEM contact indicated that the site was fairly minor and that they should proceed with the cleanup, but IDEM would not

review and approve the plan or oversee the work (Reference 8).

BASF proceeded with the plan in the letter, using the most contaminated monitoring well, MW-4, as the extraction well. BASF built an air stripper, and the pumped groundwater was circulated through the stripper and then discharged back to the ground (Reference 8). An air sparging unit was installed to aid in stripping the groundwater. BASF operated the system continually from August 1991 to August 1993. No groundwater or soil samples were collected at any time during or after the remediation effort (Reference 10).

BASF has removed or capped all of the monitoring wells from the investigation and has built a new storage tank pad and dike in the area south of the existing toluene tanks (References 8 and 10). During construction of the new storage tank dike in October 1993, 400 cubic yards of dirt (75 feet x 30 feet x 5 feet deep) were removed. When digging began, there was a slight toluene odor noted, but when monitoring equipment was brought out to the area, no VOCs were detected. The dirt removed was used to backfill and landscape around the outside of the dike wall (Reference 10).

SUMMARY and CONCLUSIONS

Toluene contaminated soil was incidentally dicovered on property owned by R.R. Donnelly and leased by BASF. This contamination was apparently not the result of a spill or any direct action taken by either the owner or the operator. It is believed to have been an indirect result of industrial processes conducted by BASF on the property.

Though not required, BASF has made a demonstrated effort to remediate the surrounding soil and groundwater through air sparging, and pump and treat carbon filtering. This treatment plan was expected to decrease concentrations of toluene to nondetectable levels. There is not evidence to indicate this site poses environmental or human health problems to the local population.

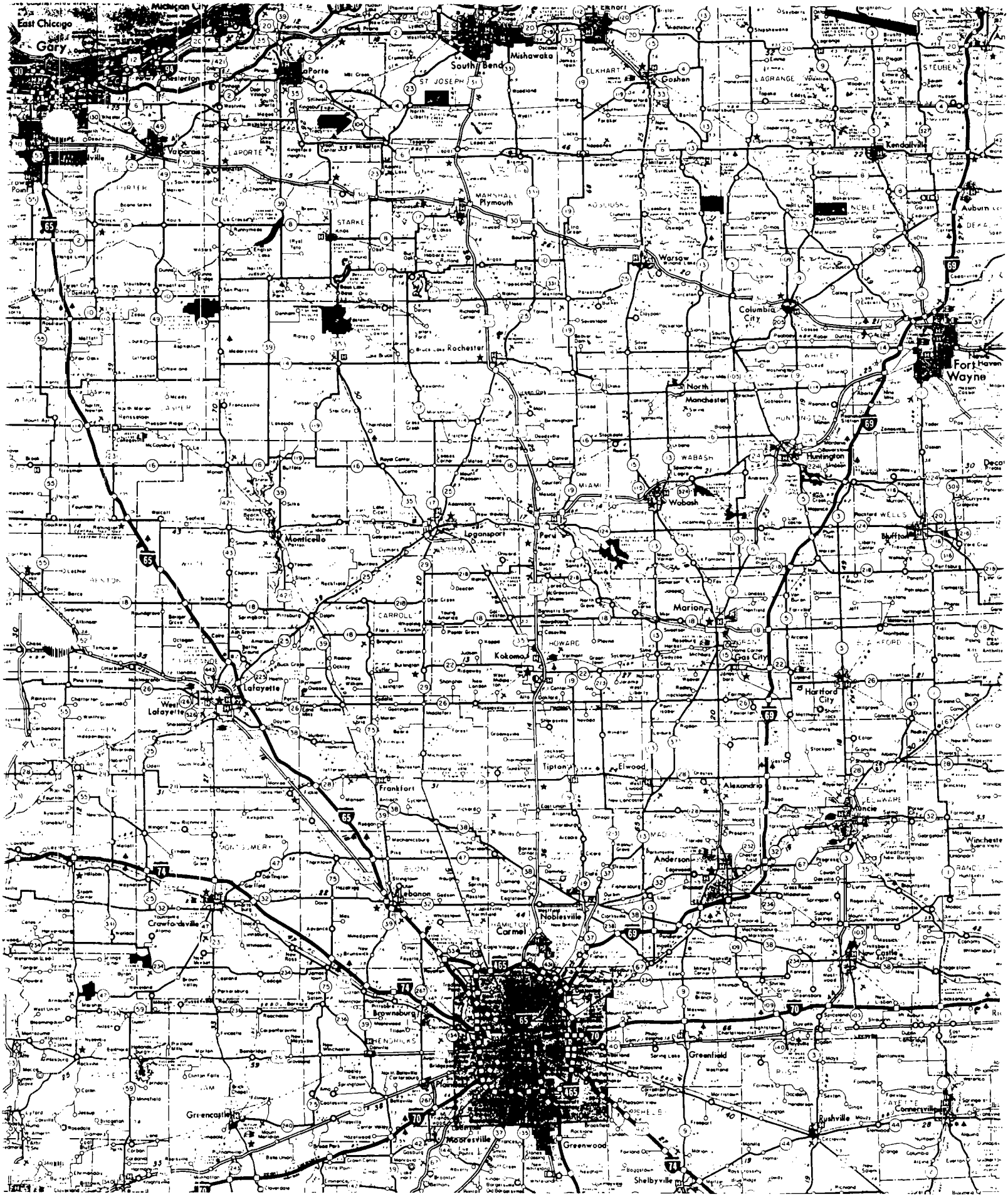
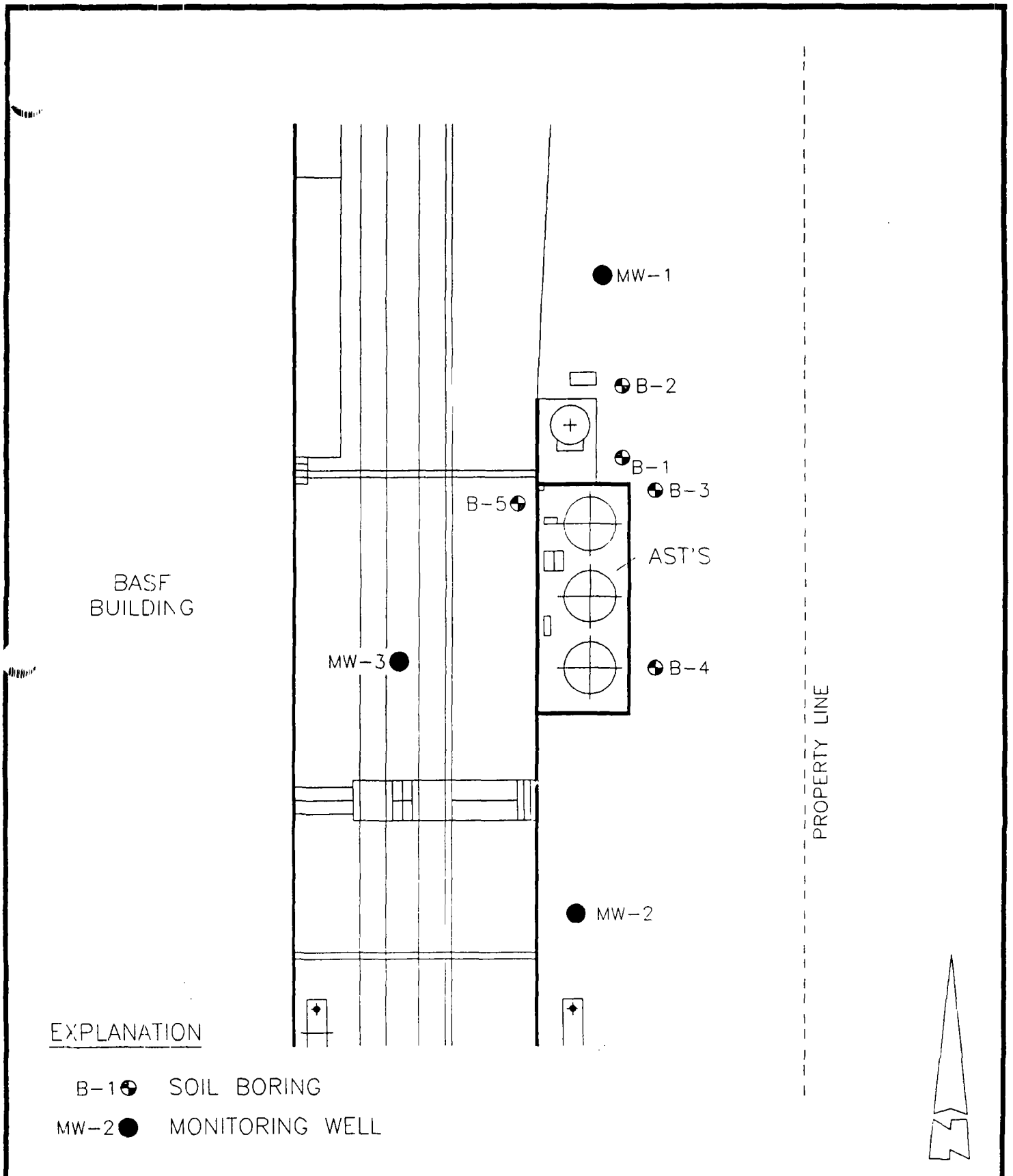

East Chicago
Gary
Michigan City
LaPorte
South Bend
Mishawaka
Elkhart
Goshen
Kendallville
Valparaiso
Plymouth
Warsaw
Auburn
Columbia City
Fort Wayne
Rochester
North Manchester
Huntington
Wabash
Monticello
Logansport
Peru
Marion
Kokomo
Gas City
Hartford City
Lafayette
West Lafayette
Frankfort
Tipton
Elwood
Alexandria
Muncie
Anderson
Lebanon
Noblesville
Carmel
Crawfordsville
Brownsburg
Greenfield
New Castle
Greencastle
Rushville
Connersville
Martinsville
Greenwood
Shelbyville

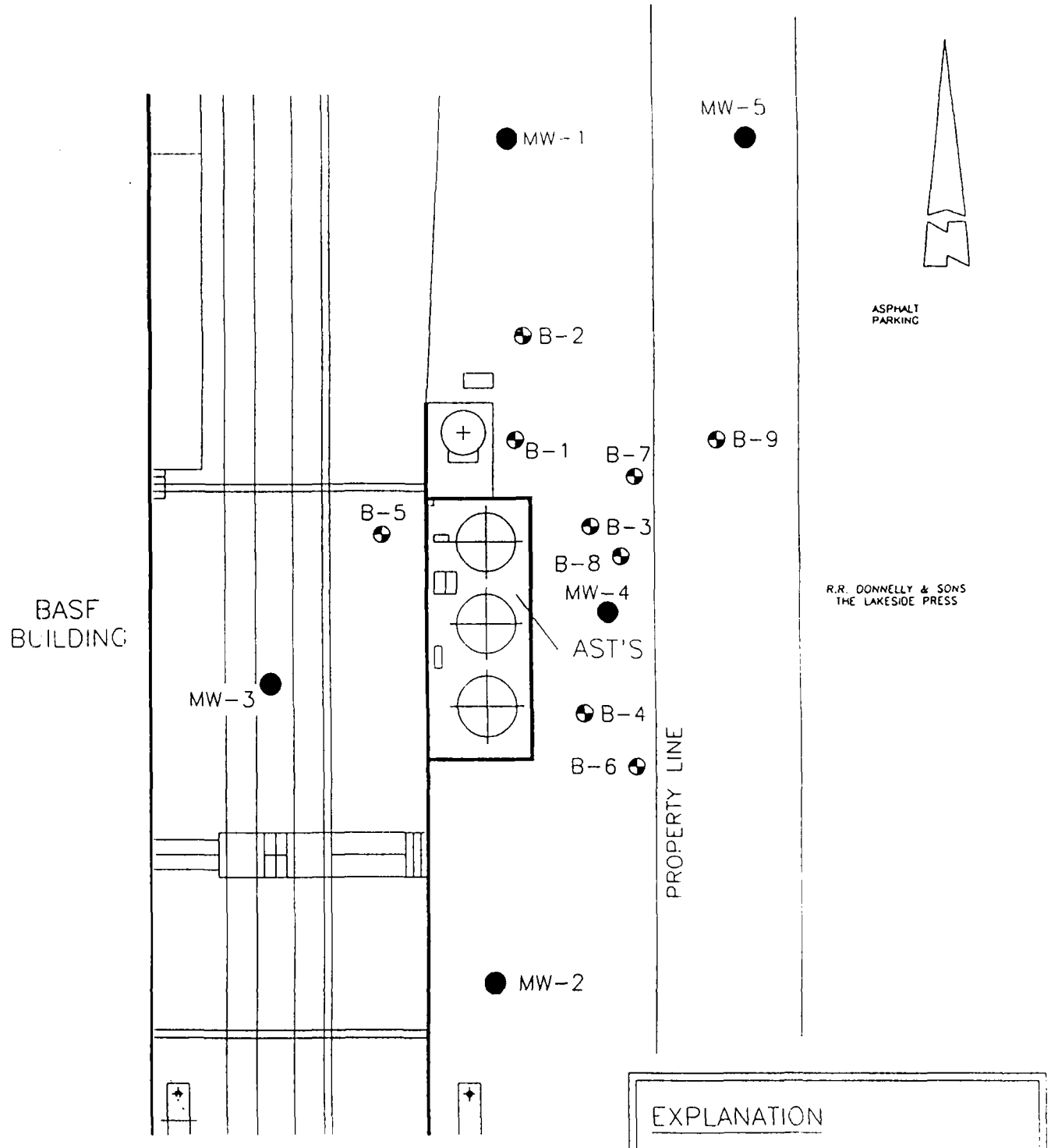
Figure 1



SOIL BORING & MONITORING WELL LOC.
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO	21-97671
SCALE	NONE
FIGURE NO.	3

ATEC



SOIL BORING & MONITORING WELL LOC.
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.
21-07184

SCALE
1" = 30'

FIGURE NO.
4

ATEC

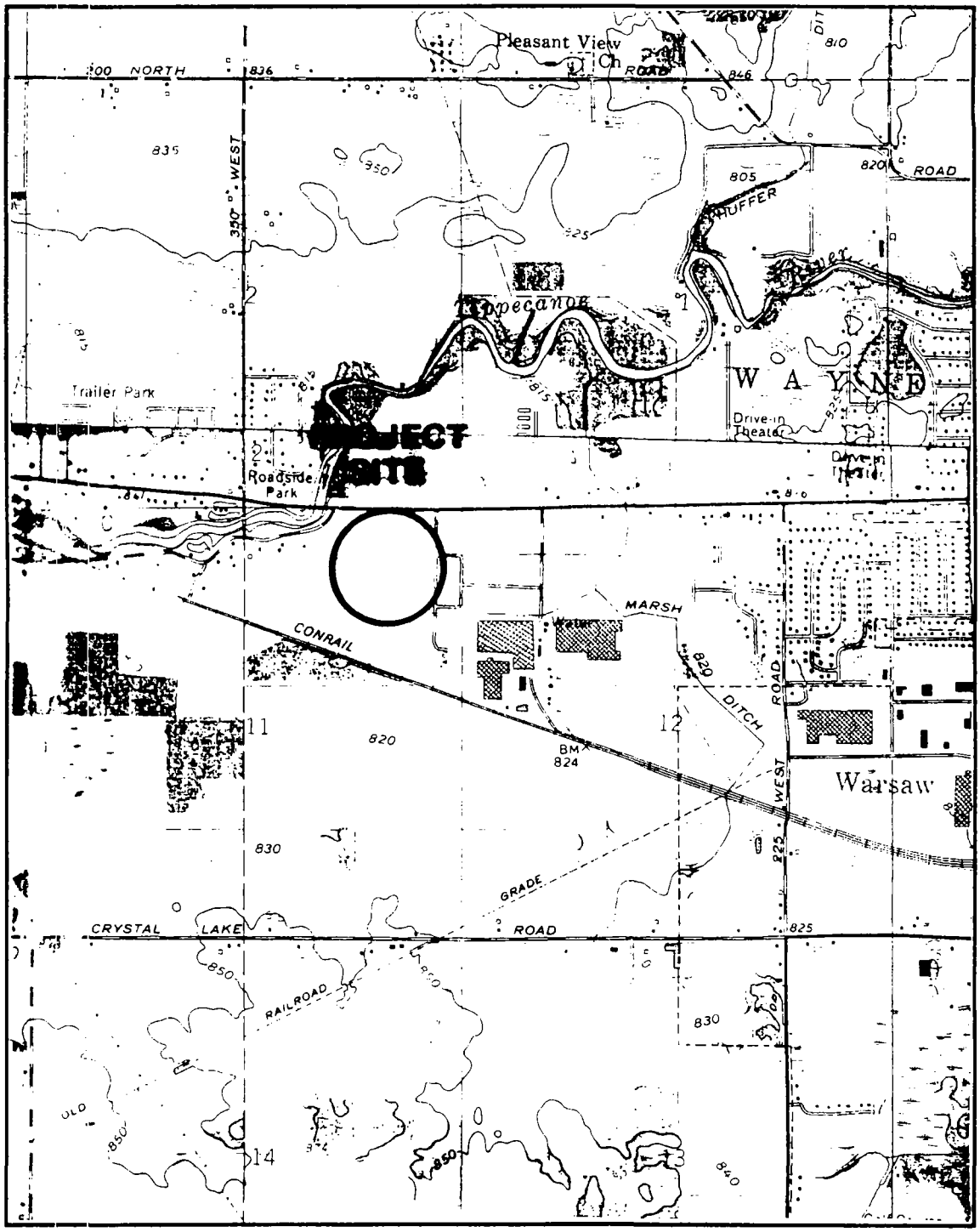
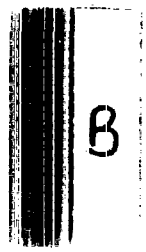


Figure 2

VICINITY MAP
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.
21-97671
SCALE
1" = 2000'

ATEC


B

REFERENCES

1. PRC Environmental Management, Inc. for Indiana Department of Environmental Management (IDEM). August 7, 1992. Compliance Evaluation Inspection for BASF Corp.

2. Latitude and Longitude Calculation Worksheet for BASF Corp.

3. IDEM, Emergency Response Branch. November 30, 1989. Initial Incident Report Log, Incident #8911139.

4. IDEM, Emergency Response Branch. April 27, 1990. Final Incident Report, Incident #8911139.

5. ATEC Environmental Consultants. February 27, 1990. Subsurface Investigation Report.

6. ATEC Environmental Consultants. June 28, 1990. Phase II Subsurface Investigation, Additional Delineation.

7. Heritage Remediation/Engineering, Inc. July 23, 1991. Environmental Site Assessment.

8. Stover, Loy. June 30, 1994. Telephone Call Report with Loy Stover of BASF Corp.

9. Wells, Patricia. August 21, 1991. Letter from Patricia Wells, BASF, to Dorel Hunt, IDEM.

10. Herring, Mike. July 26, 1994. Letter from Mike Herring, BASF, to Mary Beth Schmucker, IDEM.

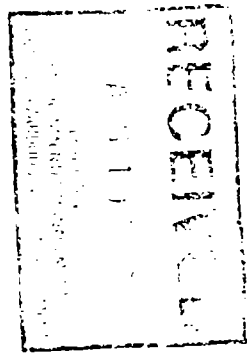
PRC Environmental Management, Inc.
233 North Michigan Avenue
Suite 1621
Chicago, IL 60601
312-856-8700
Fax 312-938-0118

Ref 1

COMPLIANCE EVALUATION INSPECTION

BASF CORPORATION
WARSAW, INDIANA

FINAL REPORT



Prepared for

Indiana Department of Environmental Management
Indianapolis, IN 46206-6015

Contract	:	Great Lakes Basin FY92
EPA Region	:	5
Site No.	:	IND 026 735 506
Date Prepared	:	August 7, 1992
PRC No.	:	136-59
Prepared by	:	PRC Environmental Management, Inc. (Jack Brunner)
Contractor Project Manager	:	Jack Brunner
Telephone No.	:	312/856-8700
IDEM Contract Manager	:	Charles Grady
Telephone No.	:	317/232-3411

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC), was contracted by the Indiana Department of Environmental Management (IDEM) to conduct Resource Conservation and Recovery Act (RCRA) compliance evaluation inspections (CEI) in Indiana. As part of this assignment, PRC conducted a CEI at the BASF Corporation (BASF) facility in Warsaw, Indiana.

The objective of the CEI was to determine facility compliance with applicable hazardous waste management regulations of the Indiana Administrative Code (IAC Title 329), referencing federal regulations (40 CFR Parts 261, 262, 265, and 268).

Before conducting the CEI, PRC met with IDEM and conducted a preinspection file audit on June 16, 1992. IDEM officials provided PRC with copies of state and federal checklists to be completed during the CEI. However, IDEM files contained no information on the BASF facility. Therefore, on July 1, 1992, PRC reviewed U.S. Environmental Protection Agency (EPA) Region 5 files for the BASF facility. During the file audit, PRC completed the preinspection file audit checklist, photocopied relevant material, and became acquainted with facility operations and regulatory history as described in the files.

On July 21, 1992, PRC conducted an unannounced CEI at the BASF facility. The following personnel were present during the inspection:

• Loy Stover	BASF Production Manager
• W. Michael Herring	BASF Site Manager
• Jack Brunner	PRC Lead Inspector, IDEM Contractor
• John Grabs	PRC Inspector, IDEM Contractor

PRC interviewed facility representatives, reviewed facility records, evaluated facility waste management recordkeeping, and inspected facility waste management operations. PRC completed applicable checklists to assist in the compliance evaluation. PRC also took one photograph of the facility.

This report describes inspection findings and evaluates facility regulatory compliance. Completed inspection checklists are provided in Appendix A. The photograph taken during the inspection is provided in Appendix B. Copies of documents reviewed during the EPA Region 5 preinspection file audit are included in Appendix C. Analytical results and photocopies of field logbook notes are presented in Appendices D and E, respectively.

2.0 FACILITY BACKGROUND

This section describes the facility's location, operations, and regulatory status and history.

2.1 FACILITY LOCATION

The BASF facility is located at 3025 West Old U.S. 30 in Warsaw, Kosciusko County, Indiana. The facility is located in a rural area; however, R.R. Donnelley & Sons Company (Donnelley) is located immediately east of BASF. The location and layout of the BASF facility are shown in Figure 1.

2.2 FACILITY OPERATIONS

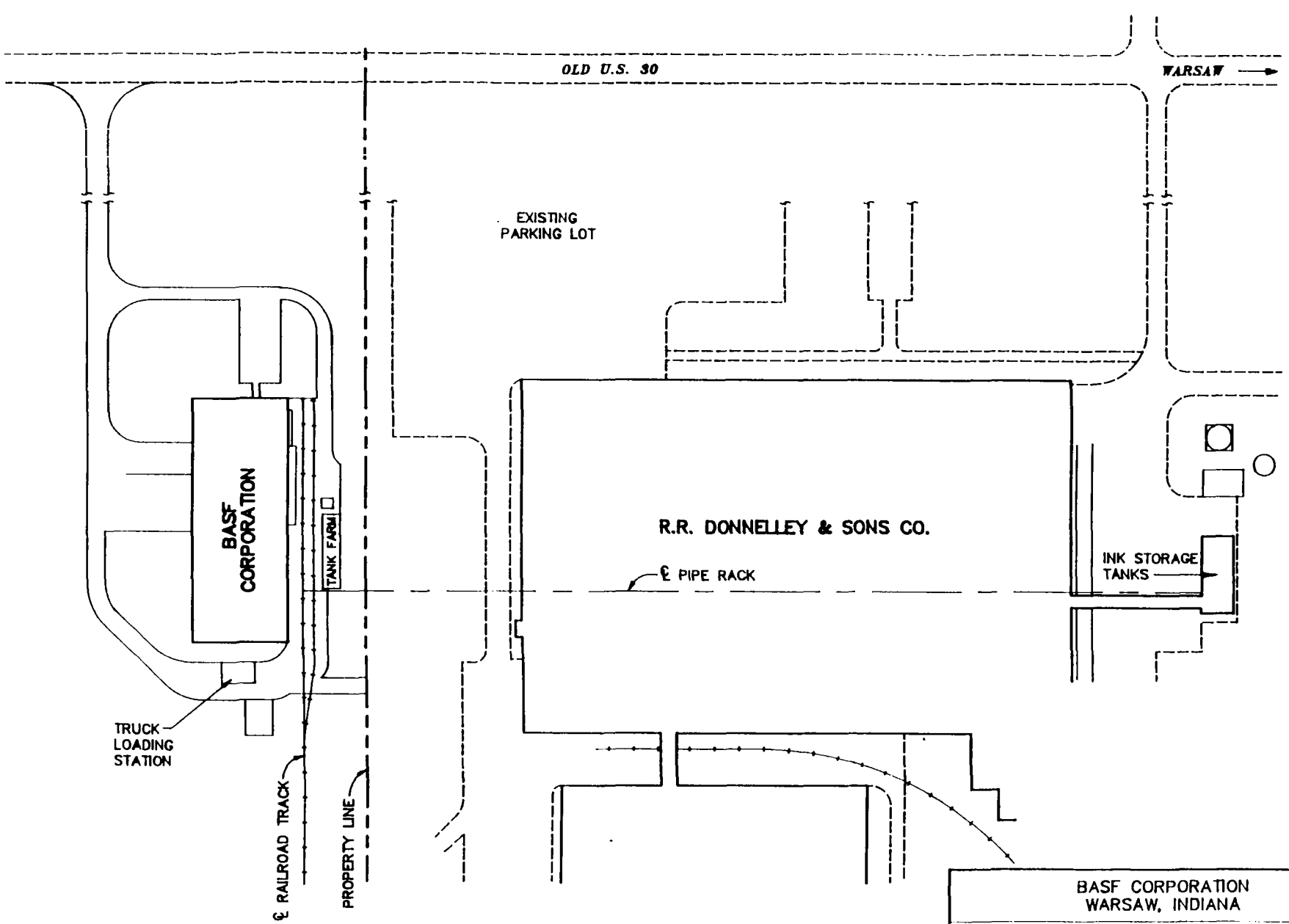
BASF manufactures gravure publication ink for its sole customer, Donnelley, in concentrate or finished ink form. Ink products are manufactured in batches. Ingredients mixed include solvent (toluene), dry resin or resonate solution, and pigment. Pigment within the solution is ground in shot mills after mixing to enhance dispersion. Final products, most of which are red, blue, and yellow inks, are typically piped directly to Donnelley's Warsaw facility. These products may also be transported via tanker truck to Donnelley's other facilities.

The BASF facility consists of a single building that houses manufacturing operations and product storage, an outdoor tank farm for solvent storage, and an outdoor truck loading station. As previously mentioned, bulk product is typically piped directly from storage tanks to the Donnelley facility. Raw toluene is purchased from Donnelley and piped directly to BASF. This toluene is material that has been reclaimed by Donnelley. BASF has 31 employees.

Donnelley owns the BASF facility and its assets, and BASF produces ink under contract to Donnelley. The Inmont Corporation (Inmont) began operation of the facility in 1981. BASF bought Inmont's contract to manufacture ink for Donnelley in 1985. No changes in the manufacturing process occurred when BASF began operations.

2.3 FACILITY REGULATORY STATUS AND HISTORY

At the time of the CEI, BASF was operating as a nonhandler of hazardous waste. Based on its facility inspection, PRC determined that the facility does not currently generate hazardous waste. However, the facility wishes to maintain its EPA identification number because it



BASF CORPORATION
WARSAW, INDIANA

FIGURE 1
FACILITY LOCATION
AND LAYOUT

SOURCE: MODIFIED FROM A BASF CORPORATION SKETCH RECEIVED BY PRC ON JULY 21, 1992

NOT TO SCALE

PRC ENVIRONMENTAL MANAGEMENT, INC.

anticipates that it may be operating as a conditionally exempt small-quantity generator or as a small-quantity generator of hazardous waste in the near future. Loy Stover, BASF Production Manager, stated that the facility has not generated hazardous waste for the past 5 years. The facility may have generated hazardous waste before that time.

In August 1980, Inmont filed a Notification of Hazardous Waste Activity (Notification) as a generator and treatment, storage, or disposal (TSD) facility. The Notification listed the following waste codes: F003, F005, K086, U220, U239, D005, and D001 (Inmont, 1980). In January 1981, Inmont filed an additional Notification indicating a different mailing address and telephone number (Inmont, 1981a). Consequently, the facility was inadvertently assigned two EPA identification numbers: IND 000 714 766 and IND 026 735 506. EPA subsequently became aware of this discrepancy and deleted the IND 000 714 766 number (EPA, 1981).

In January 1981, Inmont also submitted a Part A permit application (Part A) for 750 gallons of container storage (S01) capacity for K086 and D001 wastes (Inmont, 1981b). Inmont later notified EPA that the submittal of its Part A had been a protective filing and that the facility had never stored hazardous waste for greater than 90 days (Inmont, 1983). In March 1984, EPA approved the withdrawal of the facility's Part A (EPA, 1984).

In June 1990, BASF submitted a subsequent Notification that indicated a change in the name and contact person for the facility. However, the Notification did not indicate any hazardous waste activity (BASF, 1990).

According to information available in the files, the facility had never been inspected for RCRA compliance before PRC's visit.

3.0 WASTE STREAMS

Currently, the BASF facility generates no hazardous waste streams and one nonhazardous waste stream. However, the facility anticipates generating one hazardous waste in the near future. BASF wastes are discussed below.

At the time of the CEI, facility representatives stated that BASF generates no hazardous wastes. Ink sludge from the facility's "Hayward Strainers," which filter pigment particulates from finished ink and concentrate transfer lines, is currently reused in subsequent production batches. However, according to facility representatives, this practice may have to be temporarily discontinued because it is adversely affecting production. While the system is being purged of all particulates, ink sludge will be shipped off site. BASF anticipates that the waste will exhibit the

ignitability (D001) characteristic only, and it has sent a sample to Waste Technologies Industries (WTI) of East Liverpool, Ohio, for analysis. BASF estimates that every 1 to 2 months, one drum of this waste will be generated and shipped to WTI for incineration. When and for how long this waste will be generated are unknown. According to facility representatives, this waste has not been generated or shipped off site in the past.

BASF generates nonhazardous spent ink filters. These resin-impregnated, 30-inch, 50-micron, in-line filters remove ink solids from transfer lines between BASF and Donnelley. BASF currently generates about 96,000 pounds per year of this waste, manages the waste on site in drums, and ships it off site to Prairie View Landfill in Wyatt, Indiana, under Special Waste Permit No. 00034. BASF also has approval to dispose of this waste at County Line Landfill of Kewannee, Indiana, and Byers Sanitary Landfill of Logansport, Indiana, under Special Waste Permit No. 905830. The facility's special waste permits expire on August 31, 1994 (IDEM, 1989a; 1989b; 1990). BASF also recently applied to IDEM for permission to ship this waste to Ogden Martin Systems of Indianapolis, Indiana, for incineration (BASF, 1992).

4.0 INSPECTION FINDINGS

The CEI consisted of an entrance meeting, records review, facility inspection, and interviews with facility personnel. Significant findings are detailed below.

4.1 RECORDS REVIEW

At the time of the inspection, BASF was not generating or managing hazardous waste on site. Loy Stover, BASF Production Manager, stated that the facility had not generated hazardous waste for the past 5 years. Therefore, BASF had no records of hazardous waste activities at the facility. However, PRC reviewed analytical results and special waste permits associated with the facility's nonhazardous spent ink filters. No problems were noted.

4.2 FACILITY INSPECTION

During the inspection, PRC observed manufacturing operations at the BASF facility. No evidence of hazardous waste generation or management was noted. Appendix B provides a photograph of the BASF facility and the adjacent Donnelley facility.

5.0 INSPECTION SUMMARY AND REGULATORY DETERMINATIONS

At the time of the CEI, PRC noted that the facility was not generating hazardous waste and, therefore, was acting as a nonhandler of hazardous waste. No violations of applicable requirements were noted. As described above, facility representatives indicated that the facility may soon generate one hazardous waste. When this practice begins, the facility may be subject to the additional requirements for a conditionally exempt small-quantity generator or small-quantity generator of hazardous waste.

REFERENCES

BASF, 1990, Subsequent Notification of Hazardous Waste Activity (June 25).

BASF, 1992, Special Waste Certification Application (February 2).

EPA, 1981, Respondent Contact Record for Conversation with Larry Krisi, Inmont (September 14).

EPA, 1984, Part A Permit Withdrawal Letter to P.R. Arvidson, Inmont (March 9).

IDEM, 1989a, Special Waste Disposal Approval, Case No. 90583 (September 15).

IDEM, 1989b, Special Waste Disposal Approval, Case No. 90583 (Amendment) (October 17).

IDEM, 1990, Special Waste Disposal Approval, Case No. 00034 (January 30).

Inmont, 1980, Notification of Hazardous Waste Activity (August 13).

Inmont, 1981a, Notification of Hazardous Waste Activity (January 20).

Inmont, 1981b, Part A Permit Application (January 30).

Inmont, 1983, Letter to Richard Shandross, EPA (August 19).

Ref 2

LONGITUDE AND LATITUDE CALCULATION WORKSHEET

SITE: BASF Corp.

ADDRESS: Old U.S. 30 West

EPAID#: IND026735506

TOPOGRAPHIC MAP USED: Burket, IN Quadrangle 7.5 min series
Scale 1:24000

LONGITUDE:

Distance from 85° 52' 30" to 85° 57' 30" is 29.1 cm
Distance from 85° 52' 30" to site is 9.1 cm

$\frac{5 \text{ min}}{29.1 \text{ cm}} = \frac{x \text{ min}}{9.1 \text{ cm}}$ $x = 1.5636$ min

$.5636 \text{ min} \cdot \frac{60 \text{ sec}}{\text{min}} = 33.82 \text{ sec}$

$$\begin{array}{r} 85^\circ 52' 30'' \\ + \quad 1' 33.82'' \\ \hline 85^\circ 54' 03.82'' \end{array}$$

round to **85° 54' 04"**

LATITUDE:

Distance from 41° 15' 00" to 41° 12' 30" is 19.25 cm
Distance from 41° 15' 00" to site is 3 cm

$\frac{2.5 \text{ min}}{19.25 \text{ cm}} = \frac{x \text{ min}}{3 \text{ cm}}$ $x = .3896$ min

$.3896 \text{ min} \cdot \frac{60 \text{ sec}}{\text{min}} = 23.38 \text{ sec}$

$$\begin{array}{r} 41^\circ 14' 60'' \\ 41^\circ 15' 00'' \\ - \quad 23.38'' \\ \hline 41^\circ 14' 36.62'' \end{array}$$

round to **41° 14' 37"**

COMPLETED BY: Mary Beth Schmucker **DATE:** 7/26/94

Ref 3

INITIAL INCIDENT REPORT LOG
Emergency Response Branch
State Form 13490 (R/ 8-89)

Indiana Dept. of Environmental Management
P. O. Box 6015
Indianapolis, Indiana 46206
24 Hr Emergency Reporting Number
317/241-4336

☒ 1 SPILL ☐ 4 AIR
☐ 2 FISH KILL ☐ 5 HAZ/MAT
☐ 3 RADIATION & OTHER

MINOR ☒ SIGNIFICANT ☐ SEVERE ☐
Initial Only ☐ Yes ☒ No

INVESTIGATOR: David M. H...

INCIDENT NO.: 89 11139
CITY: Warsaw
COUNTY: Kosciusko
TITLE III REPORT? ☐ Yes ☒ No

REPORTING INFORMATION

Incident Date	Incident Time	Notification Date	Notification Time
Nov / 29 / 1989	11-1200 AM PM	Nov / 30 / 1989	AM 3:35 PM

Suspected Responsible Party	Reported By / Title
R & R Donnelly	Lee Stover - Plant Mgr / Safety & Env.
Contact / Title	**Organization**
Mrs. Deb Wieland, Envir. Eng.	Base Corp - Color / Coatings
Address	**Address**
P.O. Box 837	P.O. Box 287
City / State / Zip Code / **Phone # 219**	**City / State / Zip Code** / **Phone # 219**
Warsaw Ind 46580 / 2671946O	Warsaw Ind 46580 / 2691460J

REPORTED BY

☒ 1 Responsible Pty ☐ 5 County Health Department
☐ 2 Fed Gov't Agency ☐ 6 DNR/ Conservation Officer
☐ 3 State Gov't Agency ☐ 7 State or Local Police
☐ 4 Local Gov't Agency ☐ 8 Private Citizen ☐ 9 Other

INVESTIGATION PERFORMED BY

☒ 1 DEM - Emer Resp Branch ☐ 5 US EPA
☐ 2 Other DEM Personnel ☐ 6 Other (_____)
☐ 3 DNR/ Conservation Officer ☐ 7 DEM-ERB Field Resp
☐ 4 County Health Department

SOURCE

☐ 1 Transportation RR ☐ 4 Transportation Barge ☐ 7 Commercial ☐ 10 Unknown ☐ 13 LUST
☐ 2 Transportation Truck ☒ 5 Industrial ☐ 8 Semi-Public ☐ 11 Other (_____)
☐ 3 Transportation Pipeline ☐ 6 Agricultural ☐ 9 Municipal ☐ 12 Individual

SPILL LOCATION INFORMATION

Location (Address or Directions): Base Corp Facility (Old US 30 west)

Area: ~~Unk~~ Sq Ft / Miles — Site / Area Description: area immediately west of tank farm containments

Water Involved ? / Name	Downstream Water Users
☒ Yes ☐ No Groundwater	

MATERIAL INFORMATION

☐ 1 Petroleum Product ☒ 3 Misc Chemical ☐ 5 Agricultural Related Product ☐ 7 Other
☐ 2 Acid/Base ☐ 4 Misc Material ☐ 6 Food Related Product ☐ 8 Unknown

Material Name(s):	Phase G L S	Quantity	Lb / Gal
1 Toluene 99% Blend	☐ ☒ ☐	Unk	Gal
2	☐ ☐ ☐		Lb / Gal

CHEMICAL AND PHYSICAL CHARACTERISTICS	TLV	STEL	IDLH

Specific Gravity	Flash Point F°	LEL	UEL	Color	Odor

Reportable Quantity Lb	Other Information

CIRCUMSTANCES

☐ 1 Equipment Failure ☐ 5 Intentional Discharge
☐ 2 Transportation Accident ☐ 6 Miscellaneous
☐ 3 Employee Error ☒ 7 Unknown
☐ 4 Vandalism

ENVIRONMENTAL CONSEQUENCES

☐ 1 Water Quality Violation ☒ 5 Undetermined
☐ 2 No Water Quality Violation ☐ 6 Air Release
☐ 3 Fish Kill ☐ 7 Minimal - LOG ONLY
☐ 4 FK & WQ Violation

Ref 4

FINAL INCIDENT REPORT — EMERGENCY RESPONSE BRANCH

State Form 16107 (7-87)

Indiana Department of Environmental Management

☐ SPILL ☐ RADIATION ☐ FISH KILL ☐ AIR ☐ OTHER	Incident Number: 8911109
Town: Warsaw	County: Kosciusko
Investigator: Dorel H. Hunt	Report Date (Mo., day, yr.): Apr. 27, 1990

REPORTING INFORMATION

Incident Date (Month, day, year)	Incident Time	Notification Date (Month, day, year)	Notification Time
Nov 9 1990	9:30 AM PM	Nov 22 1989	11:59 AM PM
Responsible Party		**Reported By**	
R.R. Donnelly & Sons Co		Ms. Deb Woodward - Envir. Eng	
Contact / Title		**Organization**	
Ms. Deb Woodward Envir. Eng.		R.R. Donnelley & Sons	
Address (Street, city, state, ZIP code)		**Address (Street, city, state, ZIP code)**	
P.O Box 837 Warsaw Ind 46580		P.O. Box 837, Warsaw, Indiana 46580	
Telephone Number (include area code)		**Telephone Number (include area code)**	
(219) 267-9460		(219) 267-9460	

SPILL SCENE

Area Affected	Receiving Water	Segment
56 ft² / miles	None	# 30

Site / Area Description: Southside of property, near fence line about 100' SE of Well #5

Photos Available? ☐ Yes ■ No

Type of Area:

☐ 1. Residential ☐ 2. Commercial
■ 3. Industrial ☐ 4. Rural

SOURCE

☐ 1. Transp.-RR ■ 5. Industrial ☐ 9. Municipal STP
☐ 2. Transp.-Truck ☐ 6. Agricultural ☐ 10. Unknown
☐ 3. Transp.-Pipeline ☐ 7. Commercial ☐ 11. Other
☐ 4. Transp.-Barge ☐ 8. Semi-Public ☐ 12. Individual

INVESTIGATION PERFORMED BY

■ 1. DEM - ERB ☐ 3. Conservation Officer ☐ 5. EPA ☐ 7. DEM - ERB
☐ 2. Other DEM Personnel ☐ 4. County Health Dept. ☐ 6. Other Field

MATERIAL INFORMATION

Product	G	L	S	Quantity	lb	Gal.
1. Dried ink sludge			✓	90		✓
2. Contaminated Soil			✓	171,000	✓	

TLV	LEL	LD_{50}	Sp Gr

Other Information:

MATERIAL

☐ 1. Petroleum Product ☐ 4. Misc. Material ☐ 7. Other
☐ 2. Acid / Base ☐ 5. Agricultural Related Products
■ 3. Misc. Chemical ☐ 6. Food Related Product

CIRCUMSTANCES

☐ 1. Equipment Failure ☐ 5. Intentional Discharge
☐ 2. Transportation Accident ■ 6. Miscellaneous
☐ 3. Employee Error ☐ 7. Unknown
☐ 4. Vandalism

ENVIRONMENTAL CONSEQUENSES

☐ 1. Water Quality Violation ☐ 5. Undetermined
■ 2. No Water Quality Violation ☐ 6. Air Release
☐ 3. Fish Kill
☐ 4. Fish Kill and Water Quality Violation

LABORATORY / FIELD ANALYSIS

Test Performed	Sample Site No. 1	2	3	4	5	6
NH_3 - N mg/l						
BOD_5 mg/l						
pH						
S Solids mg/l						
T Solids mg/l						
Fecal						
DO mg/l						
Temp. F° C°						
LEL %						

Spiller and / or Lab Reports Attached? ☐ Yes ☐ No

Copies sent to:

Prepared By: Dorel H. Hunt

FISH KILL INFORMATION

Stream / Lake	Type of Pollution
Specie / Number Killed	
Conservation Officer	
Day / Time of Count	Stream Miles Affected

RECOVERY INFORMATION

Contractor	Method of Clean-up
R.R. Donnelly & Sons	Removal
Method of Disposal Alternative	Quantity Recovered (lb.)
Waste Fuel / Systech - Rolling Ohio	171,000 gal.
Remedial Action Referred to: and Adams County Landfill	

Reviewed By	Date

Ref 5

SUBSURFACE INVESTIGATION
BASF CORPORATION
WARSAW PLANT
WARSAW, INDIANA
ATEC PROJECT NUMBER 21-97671

MR. LOY STOVER
BASF CORPORATION
P.O. BOX 287
WARSAW, IN 46580

TABLE OF CONTENTS

EXECUTIVE SUMMARY

ATEC Environmental Consultants (ATEC) was retained by BASF Corporation to perform a subsurface investigation near of the aboveground storage tank (AST) area at the BASF plant in Warsaw, Indiana. Activities included the advancement of soil borings, collection of soil samples, installation of monitoring wells, collection of groundwater samples, laboratory analysis of all samples, and preparation of this report.

Eight (8) soil borings were advanced for the purpose of assessing the soil and groundwater quality beneath the site. Three (3) of these soil borings were completed as groundwater monitoring wells. One (1) soil sample was collected from each boring and groundwater samples were collected from the completed monitoring wells. All soil and water samples were analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX).

Elevated BTEX concentrations were detected in all soil samples collected with the samples from borings B-4 and B-1 exhibiting the highest BTEX levels. Groundwater samples collected from the three monitoring wells did not exhibit BTEX levels above quantitation limits.

ATEC's activities at the site suggest that a possible source of the subsurface contaminants encountered was a series of process vents located on the BASF building, adjacent to the AST pad. Use of these vents was discontinued in late 1989, and BTEX constituents are now collected within the building. A visual survey of the ASTs did not reveal evidence of leakage from the tanks.

Based upon the elevated BTEX levels encountered in samples collected, ATEC recommends additional subsurface investigation to determine the lateral extent of BTEX contamination in soil. ATEC believes no action is warranted at this time concerning the levels of toluene detected in the groundwater below the laboratory quantitation limit. At such time that the magnitude of soil contamination is determined, ATEC will provide recommendations for soil remediation options.

SUBSURFACE INVESTIGATION

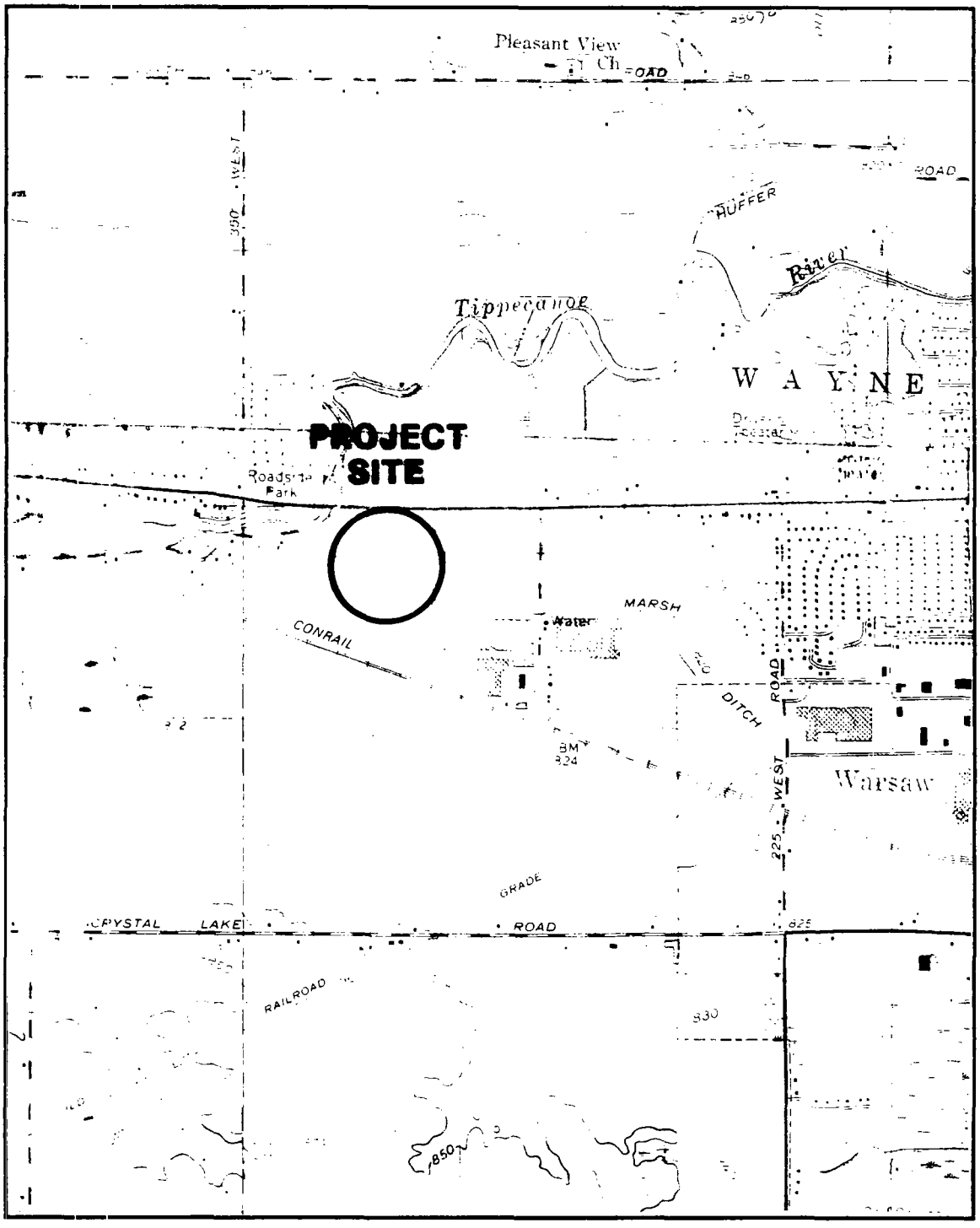
Toluene Spill
BASF Plant
Warsaw, Indiana
ATEC Project Number 21-97671

1.0 INTRODUCTION

ATEC Environmental Consultants (ATEC) was retained by BASF Corporation (BASF) to conduct a subsurface investigation at the BASF facility in Warsaw, Indiana. This investigation consisted of drilling eight (8) soil borings to the observed groundwater table, installing monitoring wells into three (3) soil borings, and collecting soil and groundwater samples for laboratory analysis. The objective of this investigation was to characterize the subsurface near three (3) aboveground storage tanks (ASTs) relative to possible soil and groundwater contamination. The location of the site is shown in Figure 1.

2.0 BACKGROUND

The project site is located near old U.S. 30 West, just west of Warsaw. The natural topography of the area is generally flat with variable natural drainage. On-site soils are developed in sandy glacial outwash lenses. Bedrock in the area is the Devonian-Muscatatuck Formation, a dolomitic limestone formation of marine origin (USGS 1987 Indiana Bedrock Geology Map).



VICINITY MAP
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-97671
SCALE	1" = 2000'
FIGURE NO.	1

ATEC

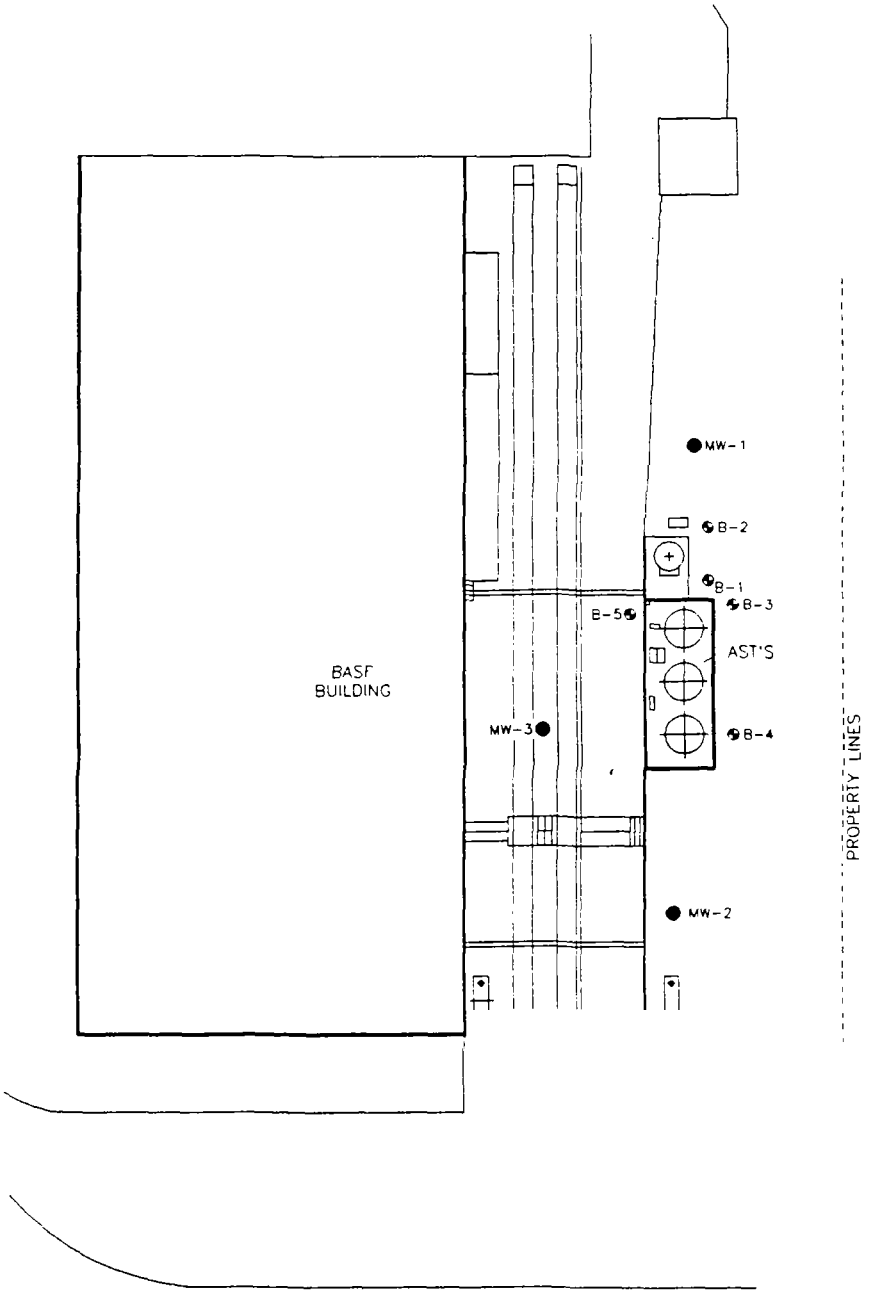
During a geotechnical investigation which was undertaken by Shilts, Graves, and Associates of South Bend, Indiana, elevated levels of toluene-based solvent were detected in all of the soil borings. This investigation was prompted by the subsidence of an AST foundation adjacent to the BASF building as shown in Figure 2. A copy of the geotechnical report prepared by Shilts, Graves, and Associates can be found in Appendix C. BASF reported the presence of this contaminant at their site to Mr. Doyle Hunt of the Indiana Department of Environmental Management (IDEM).

3.0 FIELD ACTIVITIES

3.1 Soil Sampling and Methodology

A total of eight (8) soil borings were advanced on-site. A boring plan is provided as Figure 3. Five (5) borings designated as B-1 through B-5 were drilled to a depth of 7.5 to 8.0 ft. The purpose of these borings was to determine the lateral extent of subsurface soil contamination in the vicinity of the aboveground storage tanks (ASTs). Three (3) of the soil borings, designated as MW-1 through MW-3 were drilled to a depth of approximately 13.0 ft. for the purpose of monitoring well installation. These activities provide soil and groundwater samples near the apparent lateral limit of soil contamination.

Each soil boring was advanced using a truck mounted rotary drilling rig equipped with 3-3/4 in. diameter hollow stem



EXPLANATION

B-1 SOIL BORING

MW-2 MONITORING WELL

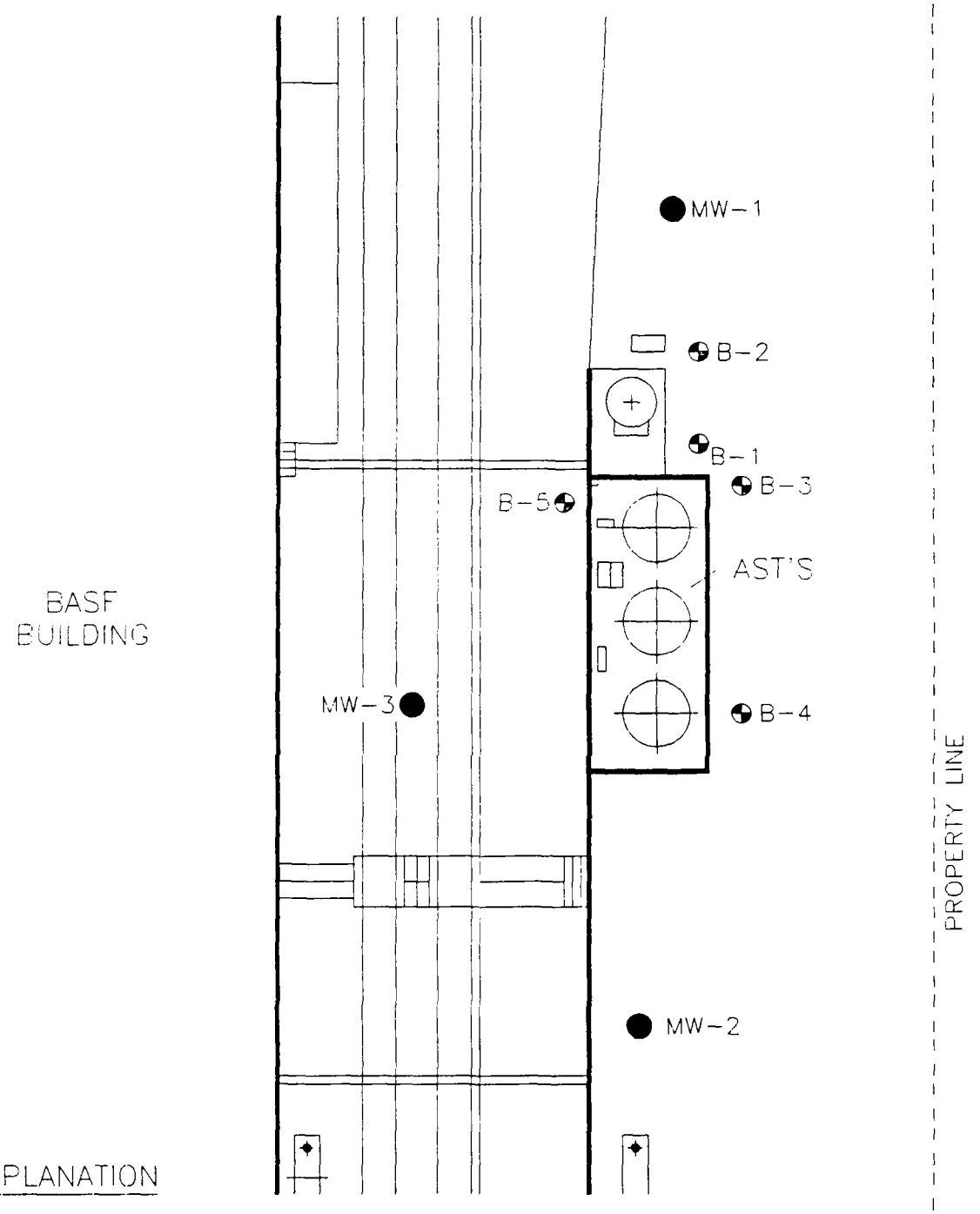
SITE PLAN
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.
21-97671

SCALE
NONE

FIGURE NO.
2

ATEC



SOIL BORING & MONITORING WELL LOC.
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-97671
SCALE	NONE
FIGURE NO	3

ATEC

augers. Soil samples were collected at 2.5 ft intervals (e.g., 1.0 to 2.5, 3.5 to 5.0, 6.0 to 7.5 ft) using a split-spoon sampler. Soil samples were classified in the field by an ATEC geologist using the Unified Soil Classification System (USCS). Boring logs describing the subsurface conditions beneath the property are presented in Appendix B.

All soil samples were visually inspected for any signs of possible contamination (i.e., staining, discoloration, odor, etc.) and were screened for total photo-ionizable vapors (TPVs) with an H-Nu photo-ionization device.

The H-Nu is equipped with a small built-in pump which continuously draws air samples into a chamber which is equipped with a photoreactive element. The indications of the photoreactive element are reported on a dial display on the instrument in ppm. Following collection of each soil sample, the sample was placed next to the H-Nu's pump inlet for measurement. The highest value recorded for each sample during this procedure was noted. For screening purposes, ATEC calibrates the instrument to 400 ppm hexane, and the reported values represent ppm as hexane. There are no established Indiana Department of Environmental Management (IDEM) or U.S. EPA standards for TPV levels. The relative magnitude of the values obtained from sampling locations is considered to be of primary importance in screening for the possible presence of contamination. The sample collected from each boring which

exhibited the highest TPV value was submitted for laboratory analysis for BTEX content.

3.2 Groundwater Sampling and Methodology

Upon installation, each monitoring well was developed by over-pumping. This method of flushing the well bore of drilling debris acts to ensure a representative connection between the well and the aquifer.

Following an appropriate settling time, groundwater samples were collected from all three (3) monitoring wells using clean rope and bailer. Before sampling each well was purged of approximately three (3) volumes of water to ensure a representative sample. Purge water was collected into drums and is currently stored on-site for future disposal. Sampling equipment was decontaminated between monitoring wells. Upon collection, the groundwater samples were submitted to the ATEC laboratory for BTEX analysis.

3.3 Surveying of Monitoring Wells

On January 31, 1990, personnel from ATEC visited the project site for the purpose of water sample collection and surveying. The three (3) monitoring wells were surveyed relative to a common datum and top of casing elevation readings for each well were collected. This data was used in conjunction with water level measurements to determine water table elevations.

4.0 ANALYTICAL RESULTS

A total of eight (8) soil samples and three (3) groundwater samples were collected, preserved, and transported to the ATEC laboratory for analysis. All accepted quality assurance/quality control (QA/QC) procedures for sample collection, preservation, and transport were observed. All laboratory tests were performed in accordance with SW 846, Analytical Test Methods. A copy of test results and analytical methods is provided in Appendix B.

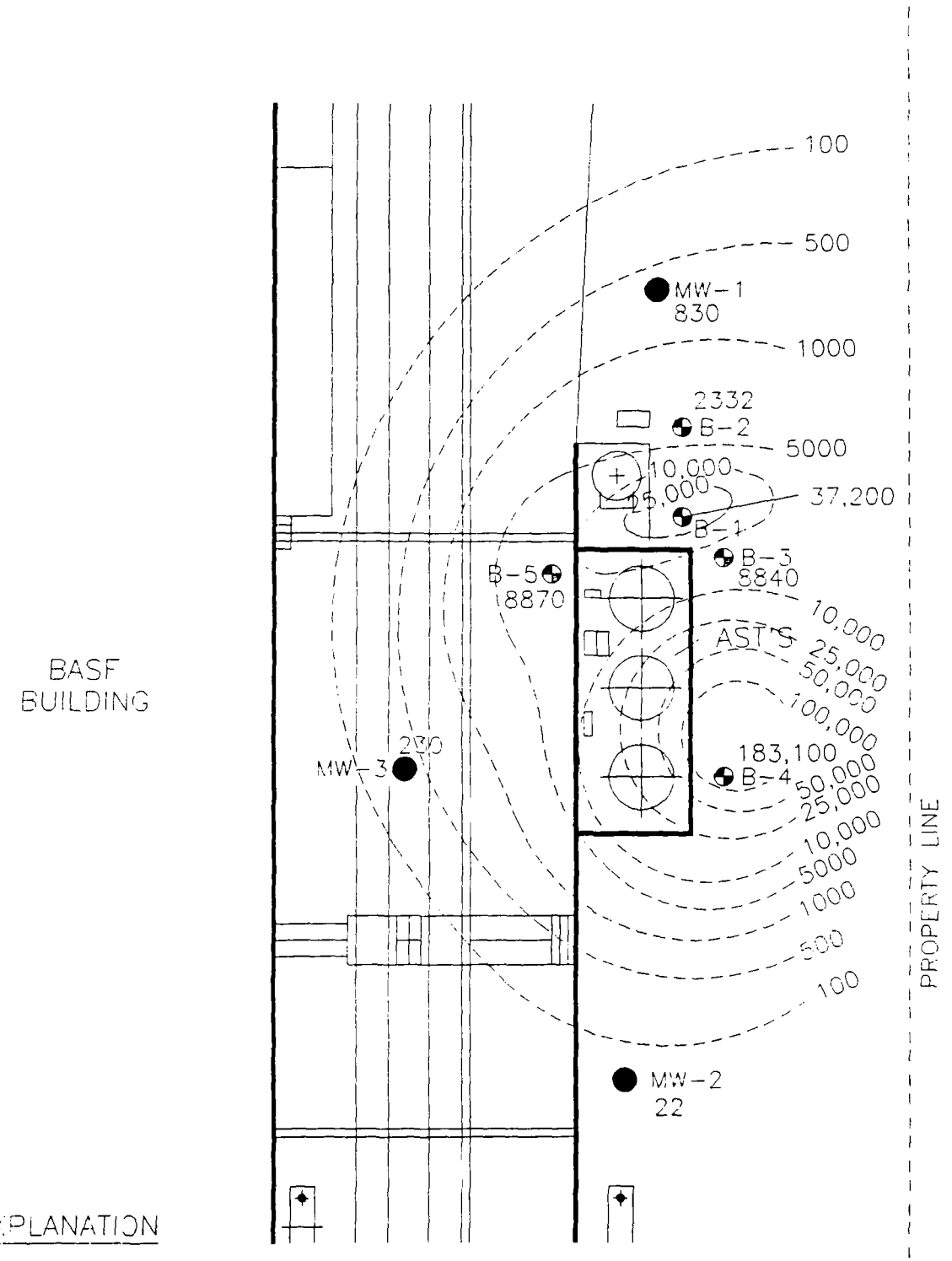
4.1 Soil Analysis Results

Table 1 details laboratory analysis results for total BTEX in the eight (8) soil samples collected. Figure 4 presents these results in the form of a total BTEX isocon map.

Table 1
Total BTEX (soils)

Sample I.D. (depth)	Total BTEX	Quantitation Limit
B-1 (6.0-7.5 ft)	37.2	63.0
B-2 (6.0-7.5 ft)	2.33	5.0
B-3 (6.0-7.5 ft)	8.84	50.0
B-4 (3.5-4.0 ft)	183.10	250.0
B-5 (3.5-4.0 ft)	8.87	250.0
MW-1 (6.0-7.5 ft)	.83	130.0
MW-2 (6.0-7.5 ft)	.02	13.0
MW-3 (6.0-7.5 ft)	.23	13.0

Concentrations reported in mg/kg, or parts per million (ppm)



EXPLANATION

B-1 ⊕ SOIL BORING

MW-2 ● MONITORING WELL

100 TOTAL BTEX CONCENTRATION – PARTS PER BILLION (ppb)

ISOCON MAP – TOTAL BTEX IN SOILS
SUBSURFACE INVESTIGATION – 20 JAN 90
BASF PLANT
WARSAW, IN

PROJECT NO.	21-97671
SCALE	NONE
FIGURE NO.	4

ATEC

BTEX in soils is used as an indicator of the presence of petroleum based products. Each constituent (benzene, toluene, etc.) may be present in varying amounts due to variations in source, interaction with the subsurface environment, or migration rate through the affected media. BASF reported that the primary constituent of the suspected source of this spill is toluene. This information is corroborated by the laboratory results, which indicates that toluene is the major constituent in the analyzed samples.

As shown, the levels of total BTEX detected most in the soils samples ranged from .02 to 183 parts per million. Further delineation of soil contamination could not be determined due to the presence of a property boundary.

4.2 Groundwater Analysis Results

BTEX analysis in water is used as an indicator of petroleum-based constituents in the dissolved phase. Toluene was detected in all three (3) groundwater samples collected. However, the amount detected was below the quantitation limit of the analysis instrument. Table 2 details laboratory analysis results for BTEX constituents in the three (3) groundwater samples collected.

Table 2
BTEX Constituents (Groundwater)

	Sample I.D.		
	MW-1	MW-2	MW-3
Benzene	<5	<5	<5
Toluene	<5*	<5*	<5*
Ethylbenzene	<5	<5	<5
Xylene	<5	<5	<5
Quantitation Limit	5	5	5

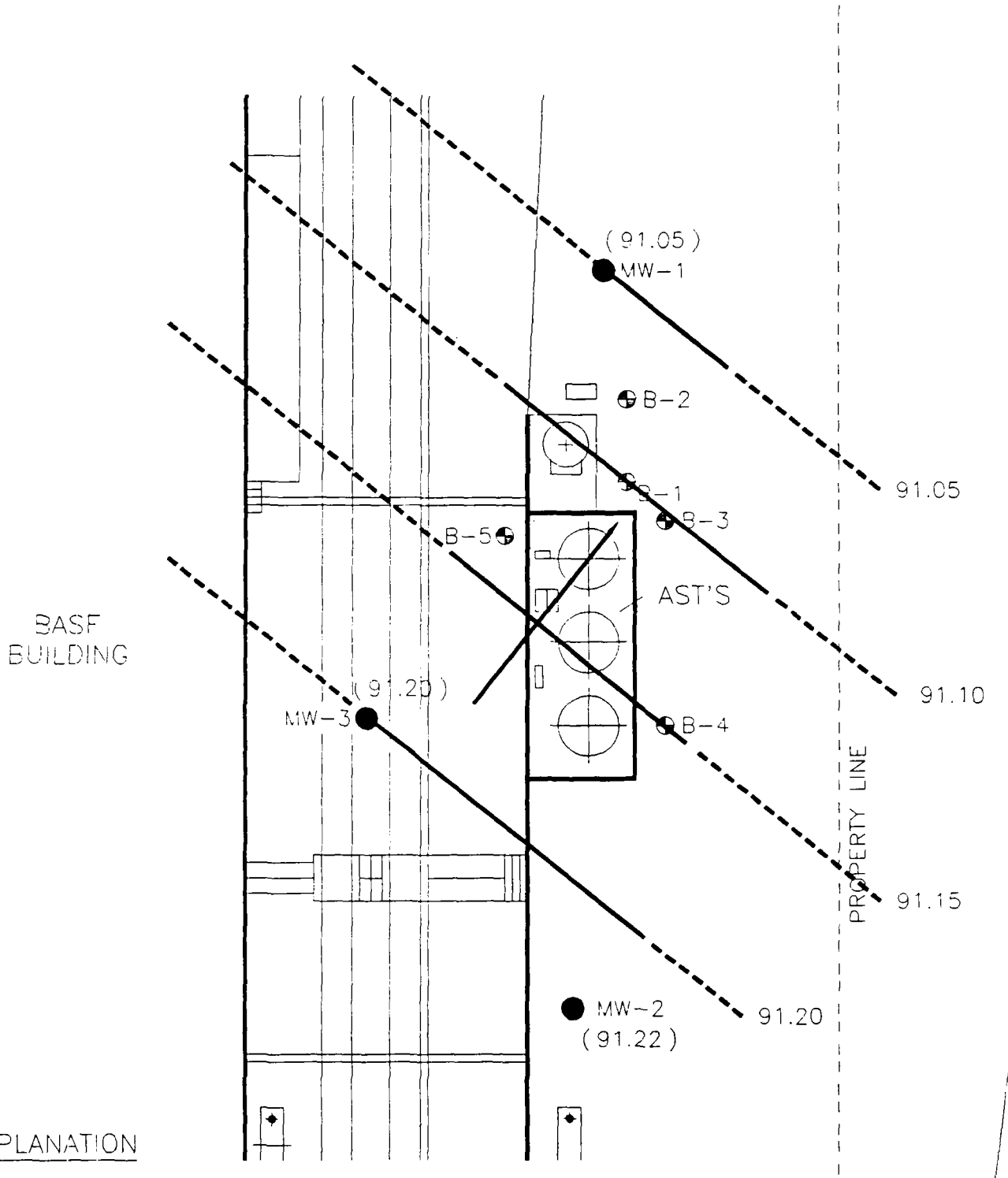
Concentrations reported in parts per billion (ppb)
* Analyte detected below quantitation limits

4.3 Groundwater Flow Direction

Water table elevation data was derived from survey data and water level measurements as detailed in Section 3.3. The locations of the monitoring wells and a water table elevation map is included as Figure 5. Based upon our survey data, groundwater flow direction at the site on January 31, 1990 was to the northeast. This data corresponds with published information which indicates regional groundwater flow to the north, toward the Tippecanoe River.

5.0 POSSIBLE CONTAMINANT SOURCES

The area of concern at the project site surrounds three (3) 17,000 gallon ASTs. These tanks rest upon a concrete pad which has apparently settled, breaking the concrete. Piping to these tanks is aboveground, through several overhead lines. Although these tanks were suspect due to their location and



EXPLANATION

B-1 ⊕ SOIL BORING

MW-2 ● (91.20) MONITORING WELL (W.T. ELEVATION – FT.)

91.20 - - - WATER TABLE CONTOUR

WATER TABLE ELEVATION MAP – 31 JAN 90
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-97671
SCALE	NONE
FIGURE NO.	5

ATEC

contents, no visual evidence of leakage was noted. Portions of the piping which were stressed by the settlement of the AST pad were replaced with flexible fittings by BASF personnel and also did not exhibit leakage.

A possible source of subsurface contamination is the presence of several process vents attached to the building just south of the AST pad. These vents reportedly were used to expel process solvent used inside the plant to the atmosphere. An unknown quantity of liquid volatiles was apparently expelled along with volatile vapors, as evidenced by discoloration and odor beneath these vents. Cracks in the parking surface near these process vents provides a possible avenue for volatiles from the vents to the subsurface. BASF reports that the use of these vents was discontinued in late 1989, and approximately 8 to 20 gallons of volatiles are recovered monthly by an internal recycling system.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The purpose of this subsurface investigation was to determine the extent of subsurface contamination present at the site. To achieve this objective, soil and groundwater samples were collected from eight (8) soil borings and three (3) monitoring wells located in the vicinity of the ASTs. The soil and groundwater samples were analyzed for BTEX content. Additionally, the wells were surveyed in reference to a common

datum, and a water table elevation map was generated from this data.

Two (2) possible sources of the BTEX soil contamination were noted by ATEC. The ASTs were initially suspected of leaking. Two (2) tests could be performed to ascertain whether these tanks are leaking. First, a tank tightness test could be performed to determine the integrity of the tanks. Second, product inventory records for the tanks (if such records exist) could be reviewed and compared for deficiencies.

The second possible source of BTEX was the process vents mounted to the building. The current recovery rate of 8 to 20 gallons of BTEX per month suggests a historical loss at a similar rate. These vents are no longer in use, therefore are no longer a potential source of BTEX. However, ATEC's investigation suggests that the process vents may have presented a source of the elevated BTEX levels in the soils near the ASTs.

Based upon data collection by ATEC, elevated levels of BTEX in the shallow soils were discovered in the vicinity of the AST pad. The lateral extent of these elevated BTEX levels was well defined to the north, south, and west of the AST pad. The eastern extent of the elevated BTEX levels was not delineated, however, due to limited access to adjacent property. ATEC recommends the advancement of additional

borings to the east of the AST pad to delineate the extent of elevated BTEX levels in soils.

Elevated levels of BTEX were not encountered in any of the groundwater samples collected from the monitoring wells. Therefore, ATEC makes no recommendations for action concerning groundwater.

7.0 QUALIFICATIONS

Our professional services have been performed, our findings and our recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

The work performed in conjunction with this assessment and the data developed, are intended as a description of available information at the dates and locations given. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

The present study included a limited number of borings across the entire project site. The conclusions drawn from the

investigation are considered reliable, however, there may exist localized variations in subsurface conditions that have not been completely defined at this time. It should be noted that subsurface conditions may be better delineated with increased subsurface exploration including test pits, soil borings with sample collection and laboratory testing, and surface geophysical survey techniques.

APPENDIX B

LABORATORY RESULTS

February 2, 1990

Mr. Lawrence Kahrs
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: Eight Soil BTEX
SW 846 Method 8240
BASF
ATEC Project Number 21-97671

Dear Mr. Kahrs:

Enclosed are the results of the Organic Analyses for the eight soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on January 23, 1990, on behalf of BASF. These samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/feb

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: B-1
Sample Matrix: Soil
Date Sample Collected: January 20, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 30, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-1

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<63*	63
Toluene	108-88-3	33,000	63
Ethylbenzene	100-41-4	1,100	63
Total Xylenes		3,100	63

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: B-2
Sample Matrix: Soil
Date Sample Collected: January 20, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<5*	5
Toluene	108-88-3	2,300	5
Ethylbenzene	100-41-4	9	5
Total Xylenes		23	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: B-3
Sample Matrix: Soil
Date Sample Collected: January 20, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-3

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<50*	50
Toluene	108-88-3	8,700	50
Ethylbenzene	100-41-4	<50*	50
Total Xylenes		140	50

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Klein
Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: B-4
Sample Matrix: Soil
Date Sample Collected: January 20, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-4

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<250*	250
Toluene	108-88-3	150,000	250
Ethylbenzene	100-41-4	8,100	250
Total Xylenes		25,000	250

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Keller
Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: B-5
Sample Matrix: Soil
Date Sample Collected: January 20, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-5

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<250*	250
Toluene	108-88-3	8,100	250
Ethylbenzene	100-41-4	<250*	250
Total Xylenes		770	250

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: MW-1
Sample Matrix: Soil
Date Sample Collected: January 21, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-6

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<130*	130
Toluene	108-88-3	830	130
Ethylbenzene	100-41-4	<130	130
Total Xylenes		<130	130

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: MW-2
Sample Matrix: Soil
Date Sample Collected: January 21, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 29, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-7

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<13*	13
Toluene	108-88-3	22	13
Ethylbenzene	100-41-4	<13	13
Total Xylenes		<13	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

Client: BASF
Client Address: P.O. Box 287
Warsaw, IN 46580

Client Sample Identification: MW-3
Sample Matrix: Soil
Date Sample Collected: January 21, 1990
Date Sample Received: January 23, 1990
Date Sample Analyzed: January 30, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00189-8

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<13*	13
Toluene	108-88-3	16	13
Ethylbenzene	100-41-4	54	13
Total Xylenes		160	13

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: January 31, 1990

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO. 21-97671 | PROJECT NAME SUBSURFACE INVESTIGATION | CLIENT BASF WADSAW, IN | LAB PROJ. NO. 900189

SAMPLERS: (Signature) D. Ben Chandler Jr.

SAMPLING METHOD: SPLIT SPOON

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARKS
B-1 (6.0-7.5')	1/20/90		✓			✓				✓		1	-1		✓							
B-2 (6.0-7.5')	1/20/90		✓			✓				✓		1	-2		✓							
B-3 (6.0-7.5')	1/20/90		✓			✓				✓		1	-3		✓							
B-4 (3.5-4.0')	1/20/90		✓			✓				✓		1	-4		✓							
B-5 (3.5-4.0')	1/20/90		✓			✓				✓		1	-5		✓							
~~B-6~~	~~1/21/90~~		✓			✓				✓		1			✓							VOID
MW-1 (6-7.5')	1/21/90		✓			✓				✓		1	-6		✓							
MW-2 (6-7.5')	1/21/90		✓			✓				✓		1	-7		✓							
MW-3 (6-7.5')	1/21/90		✓			✓				✓		1	-8		✓							

ATEC Environmental Services
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990. FAX # (317) 849-4278

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
D. Ben Chandler Jr.	1/22/90 10:00				
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:	
		Rod Barga	1-23-90 11:25am		

February 8, 1990

Mr. James Berndt
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: Three Water BTEX
U.S. EPA Method 624
Summit Bank
ATEC Project Number 21-97671

Dear Mr. Berndt

Enclosed are the results of the Organic Analyses for the three water samples which were submitted to the ATEC Environmental/ Analytical Testing Division on January 31, 1990, on behalf of Summit Bank. These samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/feb

Client: Summit Bank
Client Address: One Summit Square
P.O. Box 2345
Ft. Wayne, IN 46801

Client Sample Identification: MW-1
Sample Matrix: Water
Date Sample Collected: January 31, 1990
Date Sample Received: January 31, 1990
Date Sample Analyzed: February 7, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00258-1

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5*	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: February 7, 1990

Respectfully submitted,

Kevin S. Kline
Environmental/Analytical Testing Division

Client: Summit Bank
Client Address: One Summit Square
P.O. Box 2345
Ft. Wayne, IN 46801

Client Sample Identification: MW-2
Sample Matrix: Water
Date Sample Collected: January 31, 1990
Date Sample Received: January 31, 1990
Date Sample Analyzed: February 7, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00258-2

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5*	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: February 7, 1990

Respectfully submitted,

Kevin S. Kline
Environmental/Analytical Testing Division

Client: Summit Bank
Client Address: One Summit Square
P.O. Box 2345
Ft. Wayne, IN 46801

Client Sample Identification: MW-3
Sample Matrix: Water
Date Sample Collected: January 31, 1990
Date Sample Received: January 31, 1990
Date Sample Analyzed: February 7, 1990

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 00258-3

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5*	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: February 7, 1990

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO.: 21-97671 | PROJECT NAME: SUBSURFACE INVESTIGATION | CLIENT: BASF CORPORATION WARSAW, IN | LAB PROJ. NO.: 900258

SAMPLERS: (Signature) D. Ben Chandler Jr.

SAMPLING METHOD: BAILER

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARKS
MW-1	1/31/90		✓		✓					✓		2			✓							
MW-2	1/31/90		✓		✓					✓		2			✓							
MW-3	1/31/90		✓		✓					✓		2			✓							

LABORATORY ANALYSIS

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
D. Ben Chandler Jr.	1/31/90 4:55				

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:
		Reed Berger	1-31-90 4:56 pm	

APPENDIX A

SOIL BORING LOGS

LOG OF BORING NO. B-1

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/19/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 12.0' ft north of ASTs, concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil							
Brown dry Sandy Silt with trace Gravel (possible fill)	3.0		1	8/10/9	100	9	
Brown dry medium dense fine to coarse Sand (SP); Wet @ 6.0'; Black staining 6.0' to 6.5'		5	2	6/10/12	100	110	Toluene odor present @ 3.5' - 7.5'
Fine Sand @ 7.3' (SW)			3*	5/7/10	60	400	
Bottom of test boring @ 7.5'		10					
		15					*Soil sample collected for BTEX analysis
							Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. B-2

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 33.5' North of ASTs, concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist medium dense SILTY CLAYEY SAND (possible fill)	3.0		1	5/5/5	60	0	
Dark gray moist loose fine to coarse Sand (SP)		5	2	5/4/6	66	3	
Wet @ 5.5'							
Medium dense below 6.0'			3*	8/10/12	50	15	
Bottom of test boring @ 7.5'		10					*Soil sample collected for BTEX analysis Augers were steam cleaned prior to drilling Boring backfilled with auger cuttings upon completion Split-spoons washed with TSP and on-site rinse water
		15					

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.5 FT
AT COMPLETION 5.5 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. B-3

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; East of AST concrete dike (12.5')	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist SILTY CLAYEY SAND with trace Gravel	3.0		1	3/4/8	95	0	
Brown moist medium dense fine to coarse Sand with trace Silt and Gravel (SP)		5	2	6/8/13	70	2	
Wet @ 4.6'							
Black staining @ 7.5'			3*	5/10/11	100	200	Drove spoon twice (rock in spoon)
Bottom of test boring @ 8.0'		10					
		15					*Soil sample collected for BTX&E analysis
							Boring backfilled with auger cuttings upon completion
							Split-spoons washed with TSP with on-site water
							Augers were steam cleaned prior to drilling

WATER LEVEL OBSERVATIONS
NOTED ON RODS 4.6 FT
AT COMPLETION 4.6 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. B-4

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; East of ASTs concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist SILTY CLAYEY SAND with Gravel (Possible fill)	2.0		1	5/5/8	75	50	
Brown moist medium dense fine to coarse Sand with little Silt and Clay (SC) Wet @ 6.0'		5	2*	8/12/18	80	500	
	7.0		3	9/15/21	100	50	
Gray wet dense fine Sand (SW)							
Bottom of test boring @ 7.5'		10					
		15					*Soil samples collected for BTX&E analysis Split-spoons washed with TSP and rinsed with on-site tap water Boring backfilled with auger cuttings upon completion Augers steam cleaned prior to drilling

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. B-4

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; West of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Concrete (0.3')							
Crushed limestone fill material (0.8')							
Brown moist medium dense Silt fine to coarse Sand with trace Gravel (SM)			1	13/14/8	100	1	
	4.5						
Dark brown moist fine to coarse Sand and Gravel with trace Silt (GM)		5	2*	7/7/12	100	100	
	7.0		3	9/15/18	50	5	
Black stain @ 6.5' to 7.0'							
Brown wet dense fine Sand (SW)							
Bottom of test boring @ 7.5'		10					
		15					*Soil sample collected for BTX&E analysis
							Split-spoons washed with TSP and rinsed with on-site water
							Boring backfilled with auger cuttings and capped with concrete upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.5 FT
AT COMPLETION 5.5 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. MW-1

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/21/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; North of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil 8" (0.6')							
Brown moist medium dense Silty Sand (fine to coarse) with Gravel (SM)	2.75		1	7/7/7	100	0	
Gray moist stiff SANDY SILTY CLAY (CL)	4.5						
Brown moist fine to medium Sand with little Gravel (SW)		5	2	6/7/7	100	0	
			3*	11/8/9	50	0	
		10	4	6/6/6	100	0	
			5	4/5/6/8	100	0	
Bottom of test boring @ 13.0'		15					*Soil samples collected for BTX&E analysis HSA augers steam cleaned prior to drilling Split-spoons washed with TSP and rinsed with on-site water Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.0 FT
AT COMPLETION 5.0 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. MW-2

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/21/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 45.0' south of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.25						
Dark brown moist Silty Sand with trace Gravel SM)	3.0		1	14/9/12	100	0	
Brown moist fine to coarse Sand (SW)		5	2	5/6/8	70	0	
			3	5/6/6	100	0	
		10	4	5/8/12	100	0	
			5	8/13/25/26	100	0	
Bottom of test boring @ 13.0'		15					*Soil sample collected for BTX&E analysis HSA augers were steam cleaned prior to drilling Split-spoons washed with TSP and rinsed with on-site water Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.0 FT
AT COMPLETION 5.0 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

LOG OF BORING NO. MW-3

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; West of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Concrete 8" (0.6')	1.0						
Crushed limestone 4"	2.0		1	11/11/12	50	0	
Brown wet fine to coarse Sand and Gravel (fill)							
Crushed limestone (2.5')		5	2	11/14/21	70	0	
Brown moist dense fine to coarse Sand and Gravel with trace Silt							
Wet @ 6.0' (SP)			3*	10/12/8	40	0	
	9.0						
Brown wet dense fine to medium Sand (SW)		10	4	7/13/16	100	0	
	11.25		5	10/10/18/23	100	0	
Brown wet very dense fine to coarse Sand and Gravel (SP)							
		15					*Soil sample collected for BTX&E analysis
Bottom of test boring @ 13.0'							HSA augers were steam cleaned prior to drilling
							Split-spoons washed with TSP and rinsed with on-site tap water
							Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-1

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/19/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 12.0' ft north of ASTs, concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil							
Brown dry Sandy Silt with trace Gravel (possible fill)	3.0		1	8/10/9	100	9	
Brown dry medium dense fine to coarse Sand (SP); Wet @ 6.0'; Black staining 6.0' to 6.5'		5	2	6/10/12	100	110	Toluene odor present @ 3.5' - 7.5'
Fine Sand @ 7.3' (SW)			3*	5/7/10	60	400	
Bottom of test boring @ 7.5'		10					
		15					*Soil sample collected for BTEX analysis
							Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-2

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 33.5' North of ASTs, concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist medium dense SILTY CLAYEY SAND (possible fill)	3.0		1	5/5/5	60	0	
Dark gray moist loose fine to coarse Sand (SP)			2	5/4/6	66	3	
Wet @ 5.5'		5					
Medium dense below 6.0'			3*	8/10/12	50	15	
Bottom of test boring @ 7.5'		10					*Soil sample collected for BTEX analysis Augers were steam cleaned prior to drilling Boring backfilled with auger cuttings upon completion Split-spoons washed with TSP and on-site rinse water
		15					

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.5 FT
AT COMPLETION 5.5 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-3

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; East of AST concrete dike (12.5')	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist SILTY CLAYEY SAND with trace Gravel	3.0		1	3/4/8	95	0	
Brown moist medium dense fine to coarse Sand with trace Silt and Gravel (SP)			2	6/8/13	70	2	
Wet @ 4.6'		5					
Black staining @ 7.5'			3*	5/10/11	100	200	Drove spoon twice (rock in spoon)
Bottom of test boring @ 8.0'		10					
		15					*Soil sample collected for BTX&E analysis
							Boring backfilled with auger cuttings upon completion
							Split-spoons washed with TSP with on-site water
							Augers were steam cleaned prior to drilling

WATER LEVEL OBSERVATIONS
NOTED ON RODS 4.6 FT
AT COMPLETION 4.6 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-4

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; East of ASTs concrete dike	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.0						
Brown moist SILTY CLAYEY SAND with Gravel (Possible fill)	2.0		1	5/5/8	75	50	
Brown moist medium dense fine to coarse Sand with little Silt and Clay (SC) Wet @ 6.0'		5	2*	8/12/18	80	500	
	7.0		3	9/15/21	100	50	
Gray wet dense fine Sand (SW)							
Bottom of test boring @ 7.5'		10					
		15					*Soil samples collected for BTX&E analysis Split-spoons washed with TSP and rinsed with on-site tap water Boring backfilled with auger cuttings upon completion Augers steam cleaned prior to drilling

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-4

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; West of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Concrete (0.3')							
Crushed limestone fill material (0.8')							
Brown moist medium dense Silt fine to coarse Sand with trace Gravel (SM)			1	13/14/8	100	1	
	4.5						
Dark brown moist fine to coarse Sand and Gravel with trace Silt (GM)		5	2*	7/7/12	100	100	
	7.0		3	9/15/18	50	5	
Black stain @ 5.5' to 7.0'							
Brown wet dense fine Sand (SW)							
		10					
Bottom of test boring @ 7.5'							
		15					*Soil sample collected for BTX&E analysis
							Split-spoons washed with TSP and rinsed with on-site water
							Boring backfilled with auger cuttings and capped with concrete upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.5 FT
AT COMPLETION 5.5 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. MW-1

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/21/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; North of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil 8" (0.6')							
Brown moist medium dense Silty Sand (fine to coarse) with Gravel (SM)	2.75		1	7/7/7	100	0	
Gray moist stiff SANDY SILTY CLAY (CL)	4.5						
Brown moist fine to medium Sand with little Gravel (SW)		5	2	6/7/7	100	0	
			3*	11/8/9	50	0	
		10	4	6/6/6	100	0	
			5	4/5/6/8	100	0	
Bottom of test boring @ 13.0'		15					*Soil samples collected for BTX&E analysis HSA augers steam cleaned prior to drilling Split-spoons washed with TSP and rinsed with on-site water Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.0 FT
AT COMPLETION 5.0 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. MW-2

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/21/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; 45.0' south of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.25						
Dark brown moist Silty Sand with trace Gravel SM)	3.0		1	14/9/12	100	0	
Brown moist fine to coarse Sand (SW)		5	2	5/6/8	70	0	
			3	5/6/6	100	0	
		10	4	5/8/12	100	0	
			5	8/13/25/26	100	0	
Bottom of test boring @ 13.0'		15					*Soil sample collected for BTX&E analysis HSA augers were steam cleaned prior to drilling Split-spoons washed with TSP and rinsed with on-site water Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 5.0 FT
AT COMPLETION 5.0 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. MW-3

CLIENT	BASF	JOB NO.	21-97671
PROJECT NAME	Subsurface Investigation	START DATE	01/20/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	See Boring Plan; West of ASTs	ROCK CORE DIA.	IN.
FOREMAN	B. Moore	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Surface Elevation							
Concrete 8" (0.6')	1.0						
Crushed limestone 4"	2.0						
Brown wet fine to coarse Sand and Gravel (fill)			1	11/11/12	50	0	
Crushed limestone (2.5')		5	2	11/14/21	70	0	
Brown moist dense fine to coarse Sand and Gravel with trace Silt Wet @ 6.0' (SP)			3*	10/12/8	40	0	
	9.0						
Brown wet dense fine to medium Sand (SW)		10	4	7/13/16	100	0	
	11.25		5	10/10/18/23	100	0	
Brown wet very dense fine to coarse Sand and Gravel (SP)		15					
Bottom of test boring @ 13.0'							*Soil sample collected for BTX&E analysis HSA augers were steam cleaned prior to drilling Split-spoons washed with TSP and rinsed with on-site tap water Well materials placed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION 6.0 FT
AFTER ____ HRS. ____ FT

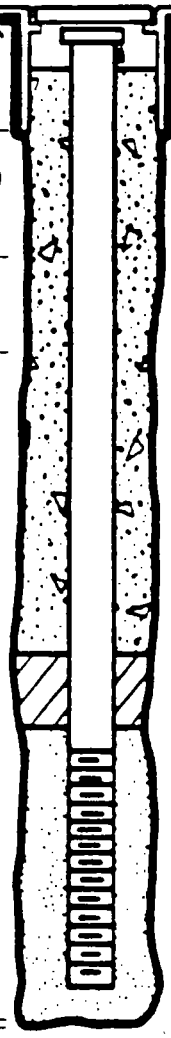
BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

NW-1

DEPTH, FT | SOIL PROFILE | CONSTRUCTION DETAILS

MANHOLE AND LOCKING CAP



0.6' Topsoil

Brown moist medium dense Silty Sand (fine to coarse) with Gravel (SM)

2.75'

Gray moist stiff SANDY SILTY CLAY (CL)

4.5'

Brown moist fine to medium Sand with little Gravel (SW)

RISER	2.2' - 0.1'
GROUT	0.5' - 0.0'
BENTONITE SEAL	1.0' - 0.5'
SAND PACK	5.0' - 1.0'
SCREEN	12.2' - 2.4'
NATURAL PACK	13.0' - 5.0'

Bottom of Test Boring @ 13.0'

Construction Material: Schedule 40 PVC

Well Diameter: 4 inches

Screen Length: 10.0 ft

Slot Size: 0.010

Development Method: Drill rig pump

Development Duration: 15 minutes (50 gallons)

Groundwater Level Observations

Date	Elev., ft
1/21/90	5.0'

MONITORING WELL DETAILS

PROJECT NO. 21-97671

SCALE None

ATEC

MW-2

DEPTH, FT

SOIL PROFILE

1.25' Topsoil

Dark brown moist Silty Sand with trace Gravel (SM)

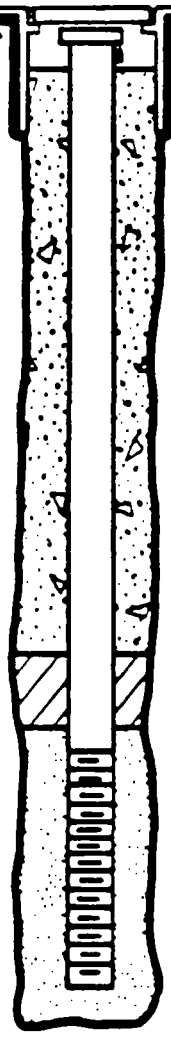
3.0'

Brown moist fine to coarse Sand (SW)

Bottom of Test Boring @ 13.1'

CONSTRUCTION DETAILS

MANHOLE AND LOCKING CAP



RISER	3.3' - 0.0'
GROUT	1.0' - +0.3'
BENTONITE SEAL	2.3' - 1.0'
SAND PACK	5.0' - 2.3'
SCREEN	13.1' - 3.3'
NATURAL PACK	13.0' - 5.0'

Construction Material: Schedule 40 PVC

Well Diameter: 4 inches

Screen Length: 10.0 ft

Slot Size: 0.010

Development Method: Drill rig pump

Development Duration: 10 minutes (55 gallons)

Groundwater Level Observations

Date	Elev., ft
1/21/90	5.0'

MONITORING WELL DETAILS

PROJECT NO. 21-97671

SCALE None

ATEC

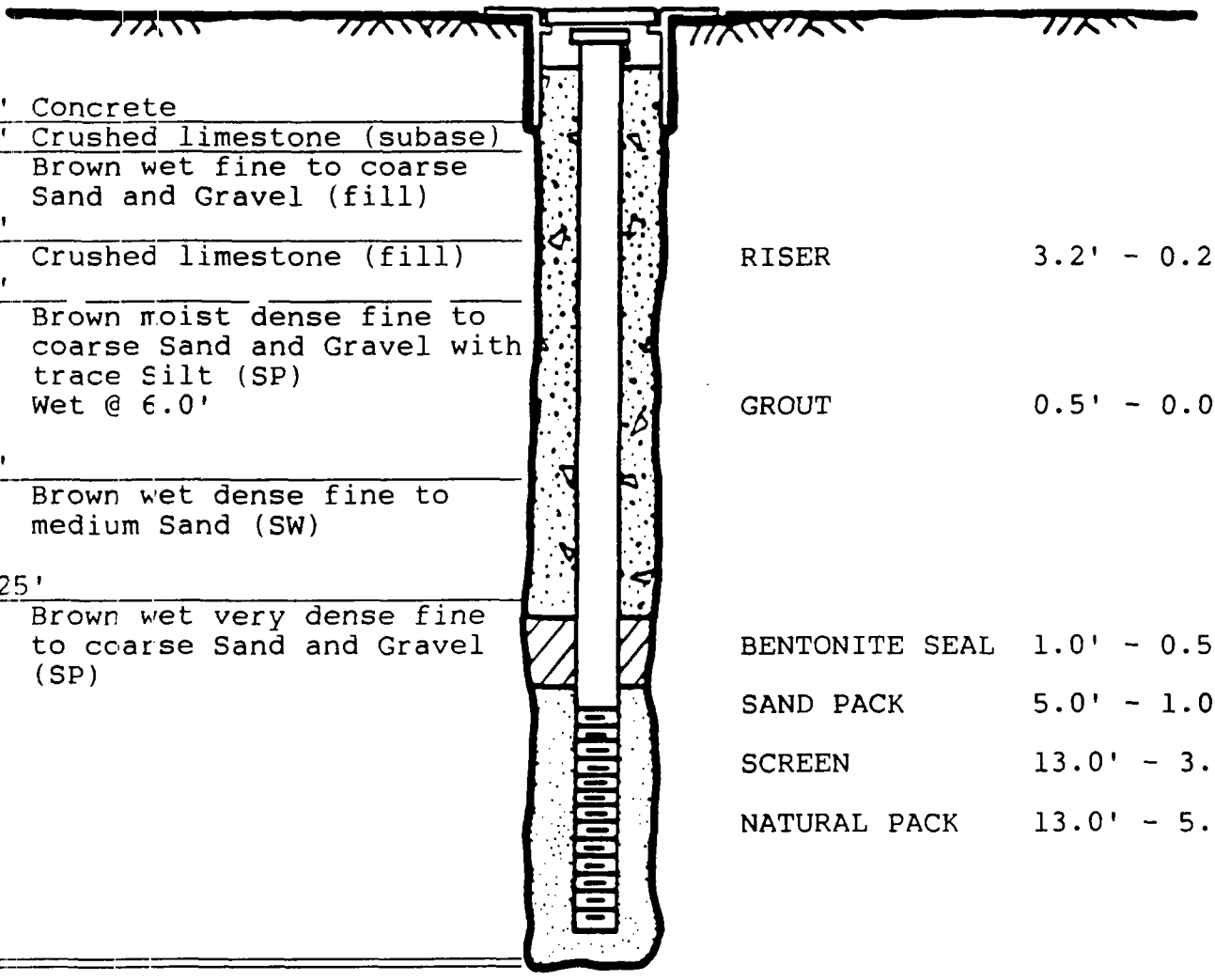
MW-3

DEPTH, FT	SOIL PROFILE
0.6'	Concrete
1.0'	Crushed limestone (subase)
	Brown wet fine to coarse Sand and Gravel (fill)
2.0'	
	Crushed limestone (fill)
2.5'	
	Brown moist dense fine to coarse Sand and Gravel with trace Silt (SP) Wet @ 6.0'
9.0'	
	Brown wet dense fine to medium Sand (SW)
11.25'	
	Brown wet very dense fine to coarse Sand and Gravel (SP)

Bottom of Test Boring @ 13.0'

CONSTRUCTION DETAILS

MANHOLE AND LOCKING CAP



RISER	3.2' - 0.25'
GROUT	0.5' - 0.0'
BENTONITE SEAL	1.0' - 0.5'
SAND PACK	5.0' - 1.0'
SCREEN	13.0' - 3.2'
NATURAL PACK	13.0' - 5.0'

Construction Material:	Schedule 40 PVC
Well Diameter:	4 inches
Screen Length:	10.0 ft
Slot Size:	0.010
Development Method:	Drill rig pump
Development Duration:	10 minutes (55 gallons)

Groundwater Level Observations

Date	Elev., ft
1/21/90	6.0'

MONITORING WELL DETAILS

PROJECT NO. 21-97671

SCALE None

ATEC

APPENDIX C

GEOTECHNICAL INVESTIGATION

SOIL INVESTIGATION

BASF Corporation
Tank Settlement
BASF Plant

Warsaw, Indiana

December 1989

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density	
Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Relative Proportions	
Descriptive Term	Percent
Trace	1 -10
Little	11-20
Some	21-35
And	36-50

Particle Size Identification		
Boulders	-8 inch diameter or more	
Cobbles	-3 to 8 inch diameter	
Gravel	-Coarse	-1 to 3 inch
	Medium	-½ to 1 inch
	Fine	-¼ to ½ inch
Sand	-Coarse	2.00mm to ¼ inch (dia. of pencil lead)
	Medium	0.42 to 2.00mm (dia. of broom straw)
	Fine	0.074 to 0.42mm (Dia. of human hair)
Silt		0.074 to 0.002mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	
Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	-11 to 15 blows/ft.
Very Stiff	-16 top 30 blows/ft.
Hard	-31 blows/ft. or more

Plasticity	
Degree of Plasticity	Plasticity Index
None to slight	0- 4
Slight	5- 7
Medium	8-22
High to Very High	over 22

Classification on logs are made by visual inspection of samples.

Standard Penetration Test — Driving a 2.0" O.D., 1-3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for ATEC to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6.0 inches of penetration on the drill log (Example — 6/8/9). The standard penetration test result can be obtained by adding the last two figures (i.e. 8+ 9 = 17 blows/ft.). (ASTM D-1586-67)

Strata Changes — In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (_____) represents an actually observed change, a dashed line (_ _ _ _) represents an estimated change.

Ground Water observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

1289-4012

Shilts, Graves & Associates, Inc.

7 December 1989

BASF Corporation
P. O. Box 287
Warsaw, Indiana 46580

ATTN: Harry Hart

RE: Soil Investigation
Tank Settlement
BASF Plant
Warsaw, Indiana

Gentlemen:

As requested by Mr. Hart we have investigated the foundation soil conditions at the subject site. Our investigation has consisted of studying the geology of the area, reading the soil survey of Kosciusko County, and making three soil borings 7.5 to 20 feet deep.

Geology tells us that the site lies in a glacial outwash plain where the soils are likely to be stratified sands and gravels with an occasional silt or clay layer. The low spots may have organic soils at the surface. The depth to bedrock is some 200 to 250 feet, so bedrock will not be a factor in assessing the cuase of the settlement.

The Soil Survey of Kosciusko County shows the natural surface soil at the site to be Sebewa loam. This is described as a deep poorly drained soil developed on outwash plains. The typical soil profile is about 11 inches of topsoil underlaid by about two feet of sandy or gravelly clay and then gravelly sand or sand. The permeability is moderate in the upper soil and rapid in the sand and gravel. The water table is near the surface in wet seasons.

The logs of the three soil borings together with graphic logs and a location sketch are included in this report. Samples of all soils encountered will be stored in our laboratory for 60 days and then discarded unless you direct otherwise.

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The soil borings show that the soil at the site consists of 0.9 ot 1.7 feet of topsil underlaid by 1.4 to 3.9 feet of silty or clayey sand then sand with gravel to depths of 14.4 to 14.5 feet and then silty clay to a depth of 20 feet. The sand soil was medium dense but the clay was medium stiff. The soil became wet at depths of 5.0 to 5.5 feet. A hydrocarbon odor was noticed in Boring 1 from 3.1 to 6.5 feet.

We understand that the concrete pad on which three 17,000 gallon tanks 10 feet in diameter and 20 feet high are supported has cracked and settled 3 to 4 inches since or during the very dry 1988 year. Since the plant was constructed in 1981, the settlement may have occurred over a longer period of time. We understand that it is now proposed to move the tanks to the area of Borings 1, 2, and 3. The topsoil should be removed from the concrete pad area for the tanks. The concrete pad for the tanks should be designed as a concrete foundation mat to force movements from freezing and thawing from cracking the slab. Also the concrete mat should be of a size that will limit the additional pressure on the underlying clay layer to no more than 250 pounds per square foot. Removing the silty or clayey sand from below the mat and backfilling with free-draining soil compacted to at least 98% of Standard Proctor (ASTM D698) maximum density would eliminate any frost heave and allow a thinner concrete mat to be used.

We also understand that it may be desireable to leave the tanks where they are. The soil there is likely to be similar to that at the borings. The cracking of the existing concrete slab is probably due to freezing and thawing and consequent heaving and settling in the silty and clayey sand under the concrete slab. The accelerated settling after the dry 1988 year is probably due to the lowering of the naturally high water table. A three foot lowering of the water table would have the effect of an additional load of almost 200 pounds per square foot on the clay layer which could cause it to settle. Also the cracked concrete slab would not spread the load from the tanks and thus increase the pressure on the clay layer to cause settlement. If the tanks are to be left in place they should be supported on temporary supports while a new concrete mat and containment wall is put in place. This new mat should be designed as outlined above for the new position for the tanks.

Our investigation has been limited to the evaluation of subsurface conditions for the support of building foundations and other related aspects of site development. The investigation does not include the assessment of possible chemical or other hazardous substance contamination in the subsoils and the presence or absence of such contamination is not implied, inferred or suggested by this report.

The discussion and recommendations in this report are based on the information and data furnished to us and presented in this report. Any change in development plans or building design may necessitate a re-evaluation of the data or a more detailed investigation. We will be glad to discuss the effect of the soil properties on your design as that design progresses.

Sincerely,

SHILTS, GRAVES & ASSOCIATES, INC.

Leroy D Graves

Leroy D. Graves, P.E.
Vice-President & Treasurer

LDG:rjc
Encls.

TEST BORING LOG

Shilts, Graves & Associates, Inc.

Boring No. 1
Sheet 1 of 1
Job. No. 89-D211

PROJECT Tank Settlement, BASF Plant

City Warsaw County Kosciusko State Indiana
Boring Location As shown on location sketch Datum Mean sea level
Date Started 11-29-89 Date Completed 11-29-89 Surface Elevation 818.7
Weather Sunny, cold Boring Method Hollow Stem Auger GROUND WATER DEPTH
Sampler: Type Split-barrel Size 2.0" O.D. At Completion * Ft.
Hammer: Wt. 140 lb. Drop 30 inches After ____ Hours ____ Ft.

*Hole caved 5.7 ft.

Soil Layer Limits From	To	Soil Description	Sample Data No.	From	To		Blows per 6"	Remarks
0.0	1.7	SAND-dark brown medium to coarse sand trace clay and gravel.	1	0.0	1.5		3-7-7	Medium.
1.7	3.1	CLAYEY SAND-red brown clayey medium to coarse sand trace gravel.	2	1.5	3.0		8-7-8	Medium.
3.1	4.4	SILTY SAND-light brown silty medium to coarse sand some gravel.	3	3.0	4.5		7-10-11	Medium. Hydrocarbon odor.
4.4	5.4	SAND-light brown fine sand.	4	4.5	6.0		5-8-11	Medium. Hydrocarbon odor.
5.4	6.5	SAND-gray fine to coarse sand trace gravel.	4	4.5	6.0		5-8-11	Medium. Hydrocarbon odor. Wet.
6.5	7.0	SAND-gray fine to medium sand.	5	6.0	7.5		6-9-9	Medium, wet.
7.0	9.0	SAND-brown fine sand.	6	7.5	9.0		3-4-7	Medium, wet.
9.0	10.9	SAND-brown medium to coarse sand some gravel.	7	9.0	10.5		3-4-8	Medium, wet.
10.9	11.5	SAND-brown fine to medium sand.	8	10.5	12.0		3-5-8	Medium, wet.
11.5	12.0	SAND-brown fine sand.	8	10.5	12.0		3-5-8	Medium, wet.
12.0	14.4	SAND-brown medium to coarse sand some gravel.	9 10	12.0 13.5	13.5 15.0		5-9-9 3-4-4	Medium, wet. Loose, wet.
14.4	20.0	SILTY CLAY-gray silty clay.	11	18.4	20.0		3-3-5	Medium stiff, moist.
								End of boring: 20.0 ft.

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TEST BORING LOG

Shilts, Graves & Associates, Inc.

Boring No. 2
Sheet 1 of 1
Job. No. 89-D211

PROJECT Tank Settlement, BASF Plant

City Warsaw County Kosciusko State Indiana

Boring Location As shown on location sketch Datum Mean sea level

Date Started 11-29-89 Date Completed 11-29-89 Surface Elevation 818.3

Weather Sunny, cold Boring Method Hollow Stem Auger GROUND WATER DEPTH

Sampler: Type Split-barrel Size 2.0" O.D. At Completion * Ft.

Hammer: Wt. 140 lb. Drop 30 inches After ____ Hours ____ Ft.

*Hole caved 4.8 ft.

Soil Layer Limits From	Soil Layer Limits To	Soil Description	Sample Data No.	From	To		Blows per 6"	Remarks
0.0	0.9	TOPSOIL-dark brown sandy clayey topsoil.	1	0.0	1.5		3-6-7	Medium.
0.9	2.0	CLAYEY SAND-red brown clayey medium to coarse sand.	1	0.0	1.5		3-6-7	Medium.
2.0	3.0	SILTY SAND-dark brown silty medium to coarse sand.	2	1.5	3.0		9-9-10	Medium.
3.0	5.0	SAND-light brown fine sand.	3	3.0	4.5		8-12-10	Medium.
5.0	6.2	SAND-light brown fine to medium sand trace gravel.	4	4.5	6.0		5-7-7	Medium, wet.
6.2	12.5	SAND-brown medium to coarse sand some gravel.	5	6.0	7.5		6-7-8	Medium, wet.
			6	7.5	9.0		2-5-7	Medium, wet.
			7	9.0	10.5		4-7-19	Medium, wet.
			8	10.5	12.0		5-7-8	Medium, wet.
12.5	14.5	SAND-brown medium to coarse sand.	9	12.0	13.5		5-9-11	Medium, wet.
			10	13.5	15.0		10-9-5	Medium, wet.
14.5	20.0	SILTY CLAY-gray silty clay trace sand.	11	18.5	20.0		3-4-5	Medium stiff, moist.
								End of boring: 20.0 ft.

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TEST BORING LOG

Shilts, Graves & Associates, Inc.

Boring No. 3
Sheet 1 of 1
Job. No. 89-D211

PROJECT Tank Settlement, BASF Plant

Warsaw County Kosciusko State Indiana

oring Location As shown on location sketch Datum Mean sea level

e Started 11-29-89 Date Completed 11-29-89 Surface Elevation 818.3

/eather Sunny, cold Boring Method Hollow Stem Auger GROUND WATER DEPTH

ıpler: Type Split-barrel Size 2.0" O.D. At Completion * Ft.

lammer: Wt. 140 lb. Drop 30 inches After ____ Hours ____ Ft.

*Hole caved 5.6 ft.

Soil Layer Limits From	To	Soil Description	Sample Data No.	From	To		Blows per 6"	Remarks
0.0	0.2	SILTY SAND-brown silty medium sand.	1	0.0	1.5		4-6-6	Medium.
0.2	1.6	SILTY SAND-dark brown silty medium to coarse sand some gravel.	1	0.0	1.5		4-6-6	Medium.
1.6	4.1	SILTY SAND-dark brown silty medium sand.	2 3	1.5 3.0	3.0 4.5		6-9-9 6-9-12	Medium. Medium.
4.1	5.5	SAND-light brown fine to coarse sand some gravel.	4	4.5	6.0		4-7-8	Medium.
5.5	7.5	SAND-brown fine sand.	5	6.0	7.5		4-7-9	Medium, wet.
								End of boring: 7.5 ft.

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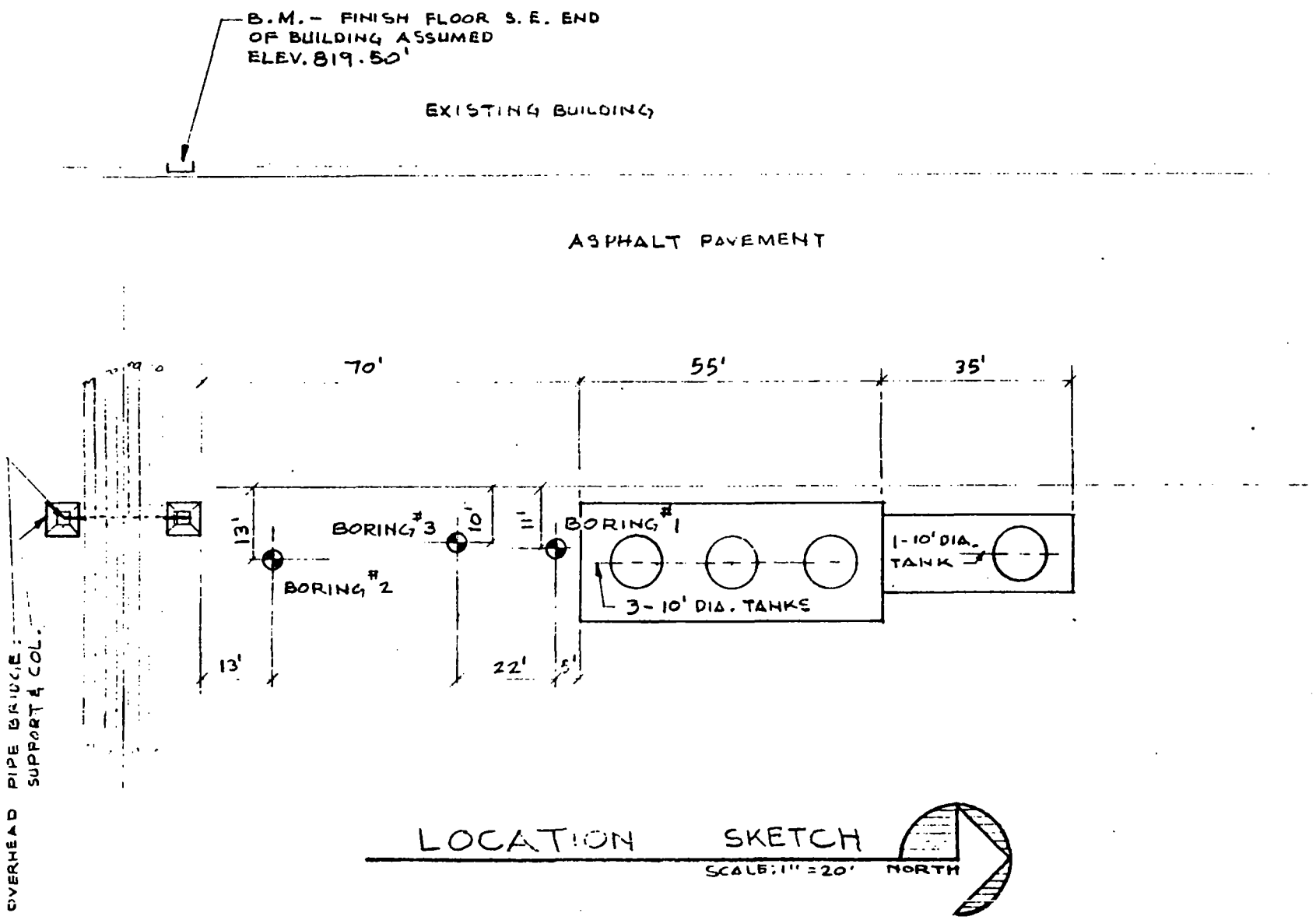
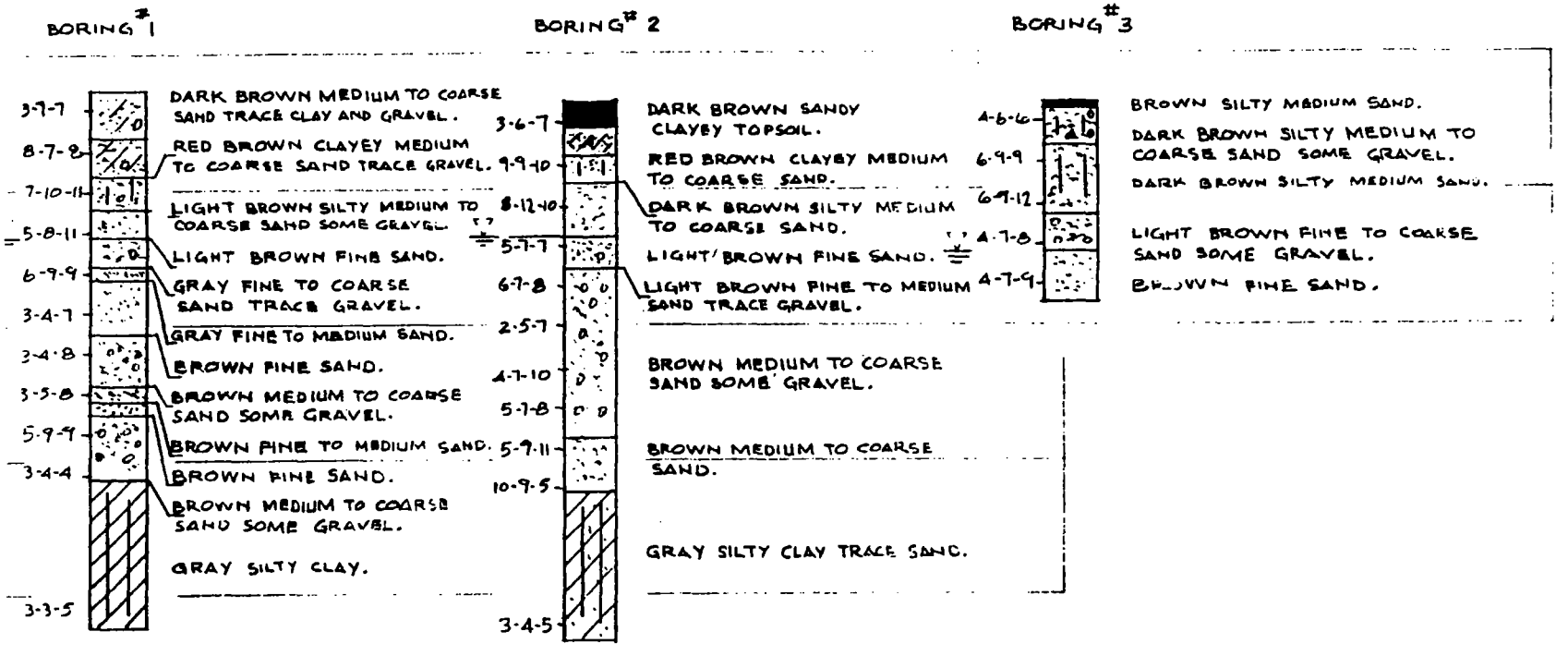

B.M. - FINISH FLOOR S.E. END OF BUILDING ASSUMED ELEV. 819.50'
EXISTING BUILDING
ASPHALT PAVEMENT
70'
55'
35'
13'
BORING #3
BORING #2
BORING #1
1-10' DIA. TANK
3-10' DIA. TANKS
13'
22'
5'
OVERHEAD PIPE BRIDGE: SUPPORT & COL.
LOCATION SKETCH
SCALE: 1" = 20'
NORTH

GRAPHIC LOGS



NUMBERS TO LEFT OF LOGS INDICATE NUMBER OF BLOWS REQUIRED TO ADVANCE SAMPLER AT SIX-INCH INTERVALS.

DEPTH AT WHICH SOIL BECAME WET.

SOIL INVESTIGATION

TANK SETTLEMENT, BASF PLANT
WARSAW, INDIANA

JOB NO. 89-D 211 | SHEET 1 OF 1

SHILTS, GRAVES & ASSOCIATES, INC

Ref 6

PHASE II SUBSURFACE INVESTIGATION
ADDITIONAL DELINEATION
BASF CORPORATION
WARSAW, INDIANA
ATEC PROJECT NUMBER 21-07184

MR. LOY STOVER
BASF CORPORATION
P.O. BOX 287
WARSAW, IN 46580

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990, FAX # [317] 849-4278

June 28, 1990

Mr. Loy Stover
BASF Corporation
P.O. Box 287
Warsaw, IN 46580

Re: Phase II Subsurface Investigation
Additional Delineation
BASF Corporation
Warsaw, Indiana
ATEC Project Number 21-07184

Dear Mr. Stover:

During the month of May, 1990, personnel from ATEC Environmental Consultants (ATEC) visited the above-referenced site for the purpose of collecting soil and groundwater samples for laboratory analysis. The purpose of this sample collection was to delineate the extent of organic constituents present in the subsurface, which were identified during ATEC's previous investigation (Project Number 21-97671).

The attached report summarizes the activities, findings and conclusions of the project. We trust this report is responsive to your needs. If you have any questions or comments regarding this report, or if we can be of additional service to you on future projects, please contact our office.

Very truly yours,

ATEC Associates, Inc.

Kelly W. Kading, C.H.M.M.
Project Environmental Geologist

Lawrence E. Kahrs
Project Engineering Geologist

KWK/ca

EXECUTIVE SUMMARY

ATEC Environmental Consultants (ATEC) was retained by BASF Corporation (BASF) to perform an additional subsurface investigation near the aboveground storage tank (AST) area at the BASF plant in Warsaw, Indiana. The objective of this investigation was to delineate the lateral extent of petroleum-based constituents in the soil, and potentially in the groundwater, originally identified during ATEC's Project Number 21-97671. Activities included the advancement of soil borings, collection of soil samples, installation of monitoring wells, and the collection of groundwater samples.

Six (6) soil borings were advanced in an attempt to delineate the lateral extent of Benzene, Toluene, Ethylbenzene and Xylene in soil and groundwater. Two (2) of these borings were completed as groundwater monitoring wells. One (1) soil sample was collected from each boring and groundwater samples were collected from the completed monitoring wells. Additionally, monitoring well MW-4 was resampled 22 days after the initial sampling event to verify laboratory results. All soil and groundwater samples were analyzed for Benzene, Toluene, Ethylbenzene and Xylene (BTEX) content.

Elevated BTEX concentrations were detected in soil from borings B-6, B-9, MW-4, MW-5 and B-8. Concentrations of measurable BTEX ranged from .005 ppm in the soil sample collected from MW-5 to 2146 ppm in the soil sample collected from boring B-8. Groundwater samples collected from the two monitoring wells exhibited BTEX concentrations which ranged from .009 ppm in MW-5 to 81 ppm in MW-4.

Based upon the findings of this investigation and the previous investigation, ATEC concludes that the soil and groundwater at the project site have been adversely impacted by a BTEX release of unknown origin and duration. Therefore, ATEC recommends remediation of the affected media according to applicable federal and state standards. Methods of remediation shall be determined at a later date, and addressed under separate cover.

TABLE OF CONTENTS

PHASE II SUBSURFACE INVESTIGATION
ADDITIONAL DELINEATION

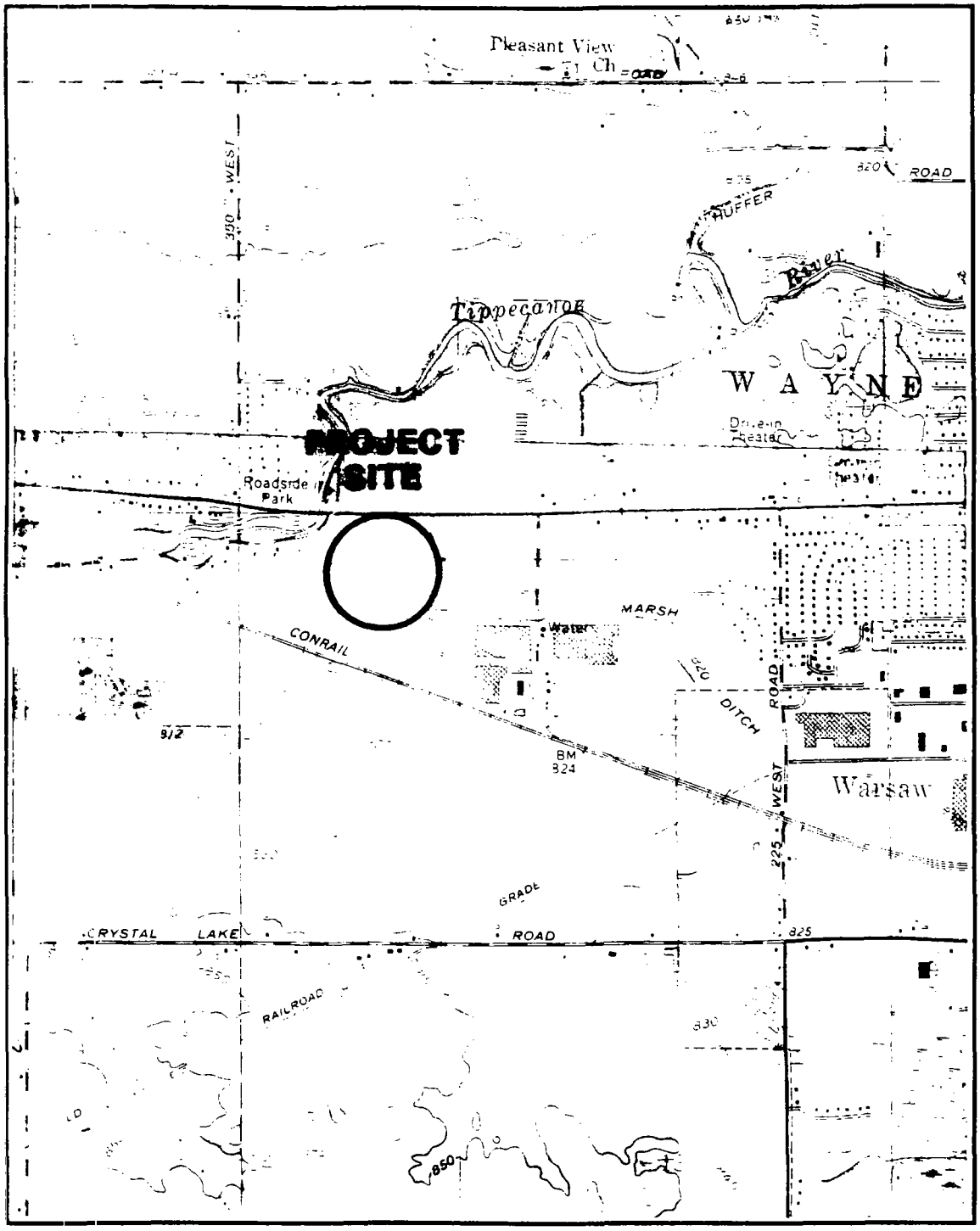
BASF Corporation
Warsaw, Indiana
ATEC Project Number 21-07184

1.0 INTRODUCTION

ATEC Environmental Consultants (ATEC) was retained by BASF Corporation (BASF) to conduct an additional subsurface investigation at the above-referenced site. This investigation consisted of advancing six (6) borings across the site. Two (2) borings were advanced to a depth of 5.0 ft. Two (2) borings were advanced to a depth of 10.0 ft. Two (2) borings were advanced to depths of 12.0 and 13.0 ft, respectively, and completed as monitoring wells. Soil and groundwater samples were collected for laboratory analysis. The objective of this investigation was to delineate the extent of organic constituents (primarily toluene) in the soil beneath the site and to determine whether groundwater beneath the soil had been affected. A vicinity map depicting the location of the site is included as Figure 1.

2.0 BACKGROUND

The project site is located south of old U.S. 30, west of Warsaw, Indiana. The natural topography of the area is generally flat with variable natural drainage. On-site soils are developed in sandy glacial outwash lenses. Bedrock in the area is the Devonian-age Muscatatuck Formation, a dolomitic



VICINITY MAP
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

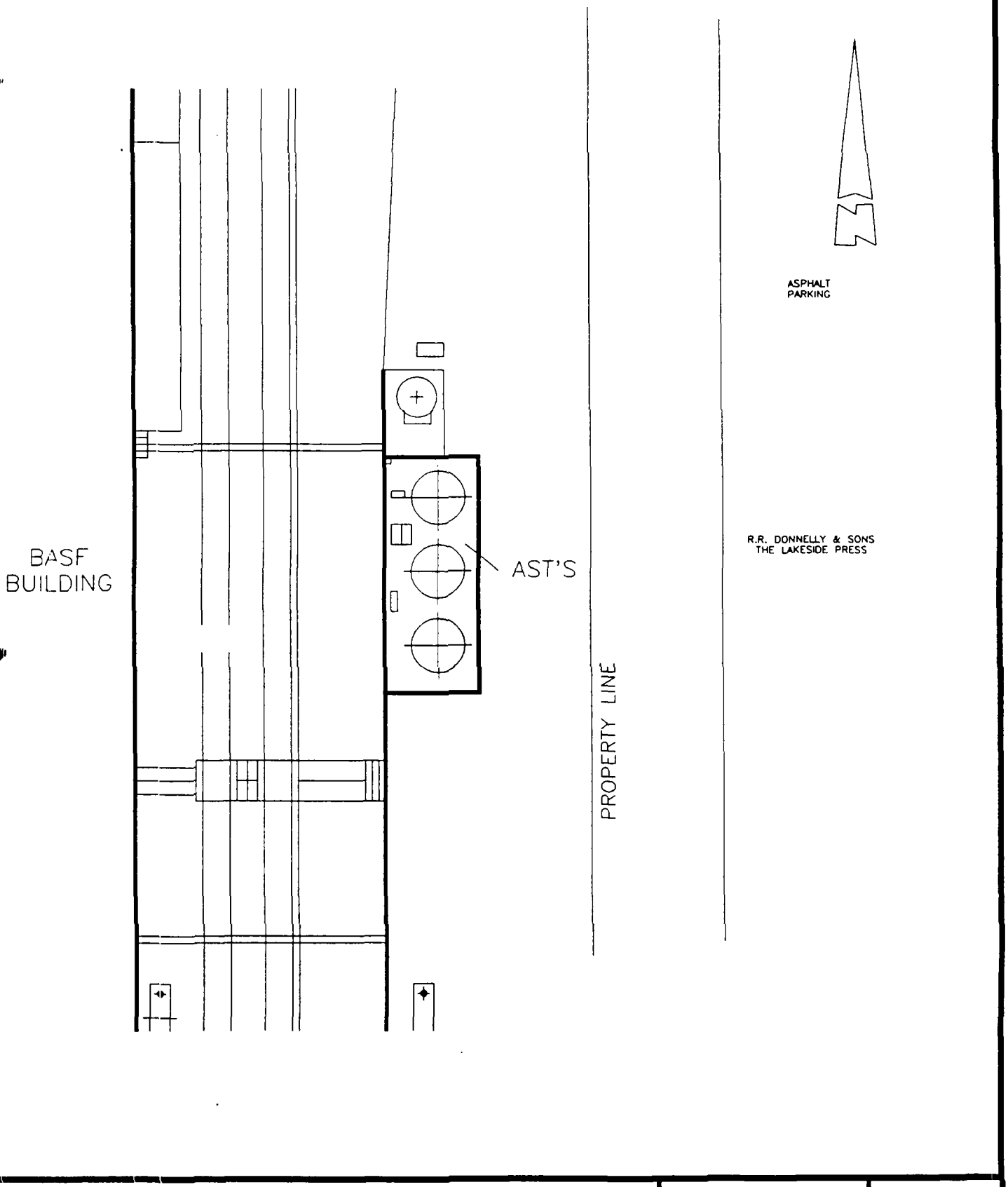
PROJECT NO.	21-07184
SCALE	1" = 2000'
FIGURE NO.	1

ATEC

limestone formation of marine origin (U.S.G.S. 1987 Indiana Bedrock Geology Map).

During a geotechnical investigation which was undertaken by Shilts, Graves, and Associates of South Bend, Indiana, elevated levels of toluene-based solvent were detected near the aboveground storage tank (AST) pad. The configuration of the site is shown in Figure 2.

During January and February of 1990, ATEC performed a subsurface investigation of the site (ATEC Project Number 21-97671). This investigation consisted of installing three (3) monitoring wells and advancing five (5) soil borings. Laboratory analysis of soil and groundwater samples indicated elevated levels of Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) (primarily toluene) in the soils. One (1) round of water level measurements collected during ATEC's previous investigation indicated that the groundwater flow direction appeared to be toward the northeast. ATEC recommended that further investigation be undertaken to determine the extent of organic constituents present in the subsurface. This report documents the findings of this additional subsurface investigation.



SITE PLAN
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-07184
SCALE	1" = 30'
FIGURE NO.	2

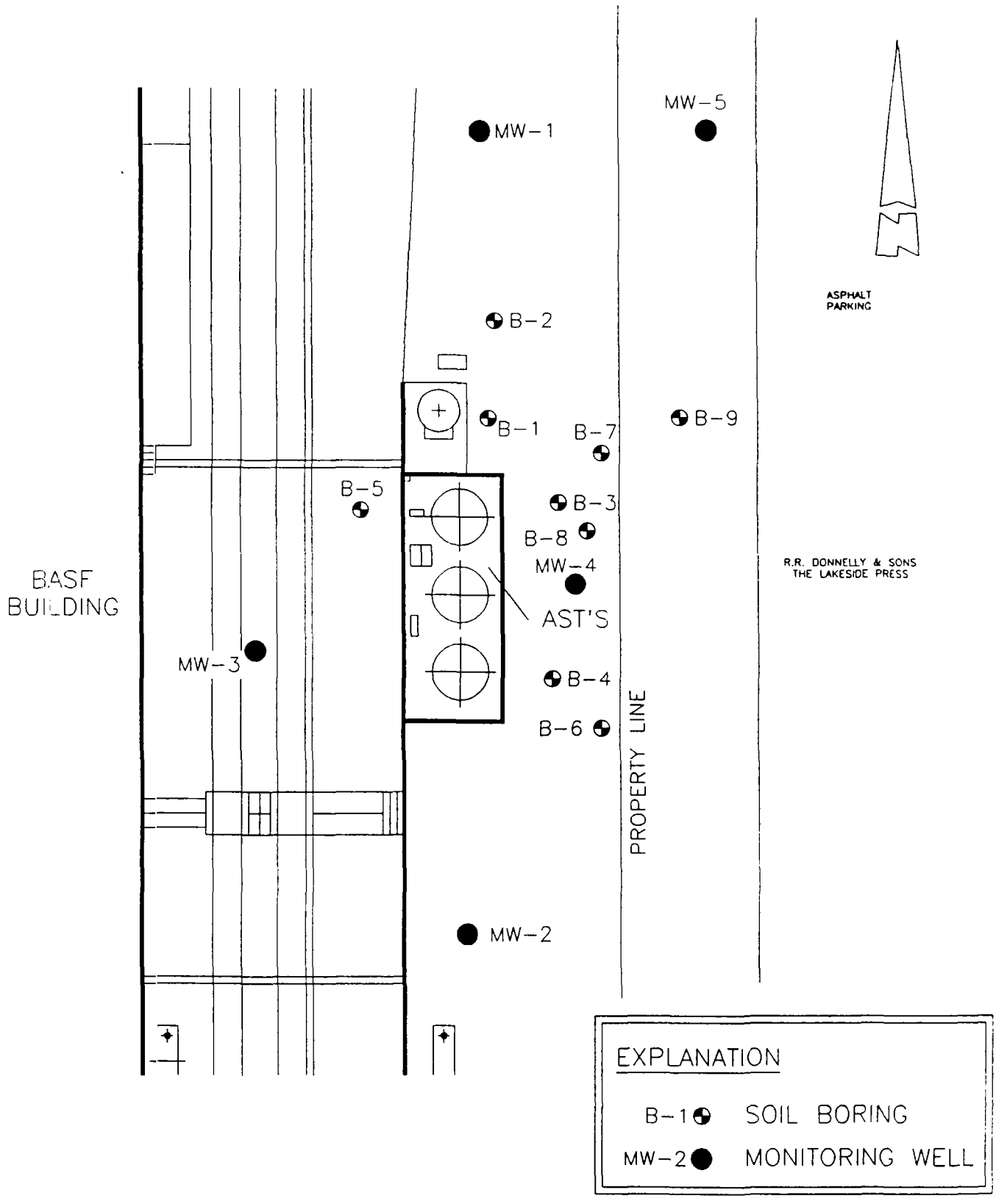
ATEC

3.0 FIELD ACTIVITIES

3.1 Soil Sampling and Methodology

A total of four (4) soil borings were advanced on-site, and two (2) soil borings were advanced on the adjacent Donnelly property to the east. Figure 3 shows the locations of these borings. Four (4) borings designated as B-6 through B-9 were drilled to a depth of 5.0 ft (B-6, B-7) to 10.0 ft (B-8, B-9). The purpose of these borings was to determine the lateral extent of organic constituents in the subsurface to the east of the ASTs. Two (2) soil borings, designated as MW-4 and MW-5 were drilled to a depth of approximately 13.0 ft for the purpose of monitoring well installation. One (1) monitoring well was installed on BASF property and one (1) monitoring well was installed on Donnelly property. The locations of the soil borings and monitoring wells were selected to allow collection of soil and groundwater samples both in and near the limits of organic constituents previously identified.

Each soil boring was advanced using a truck mounted rotary drilling rig equipped with 3-3/4 in. diameter hollow stem augers. Soil samples were collected at 2.5 ft intervals (i.e., 1.0 to 2.5 ft, 3.5 to 5.0 ft, 6.0 to 7.5 ft) using a split-spoon sampler. Soil samples were classified in the field by an ATEC geologist using the Unified Soil Classification System (USCS). Boring logs describing the subsurface conditions beneath the property are presented in Appendix A.



SOIL BORING & MONITORING WELL LOC.
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.
21-07184

SCALE
1" = 30'

FIGURE NO.
3

ATEC

All soil samples were visually inspected for any signs of possible organic constituents (i.e., staining, discoloration, odor, etc.) and were screened for total photo-ionizable vapors (TPVs) with an H-Nu photo-ionization device. Operation of the H-Nu device is described in Appendix B.

3.2 Groundwater Sampling and Methodology

Upon installation, each monitoring well was developed by over-pumping. This method of flushing the well bore of drilling debris acts to ensure a representative connection between the well and the aquifer. Each well was developed until clear non-turbid water was obtained.

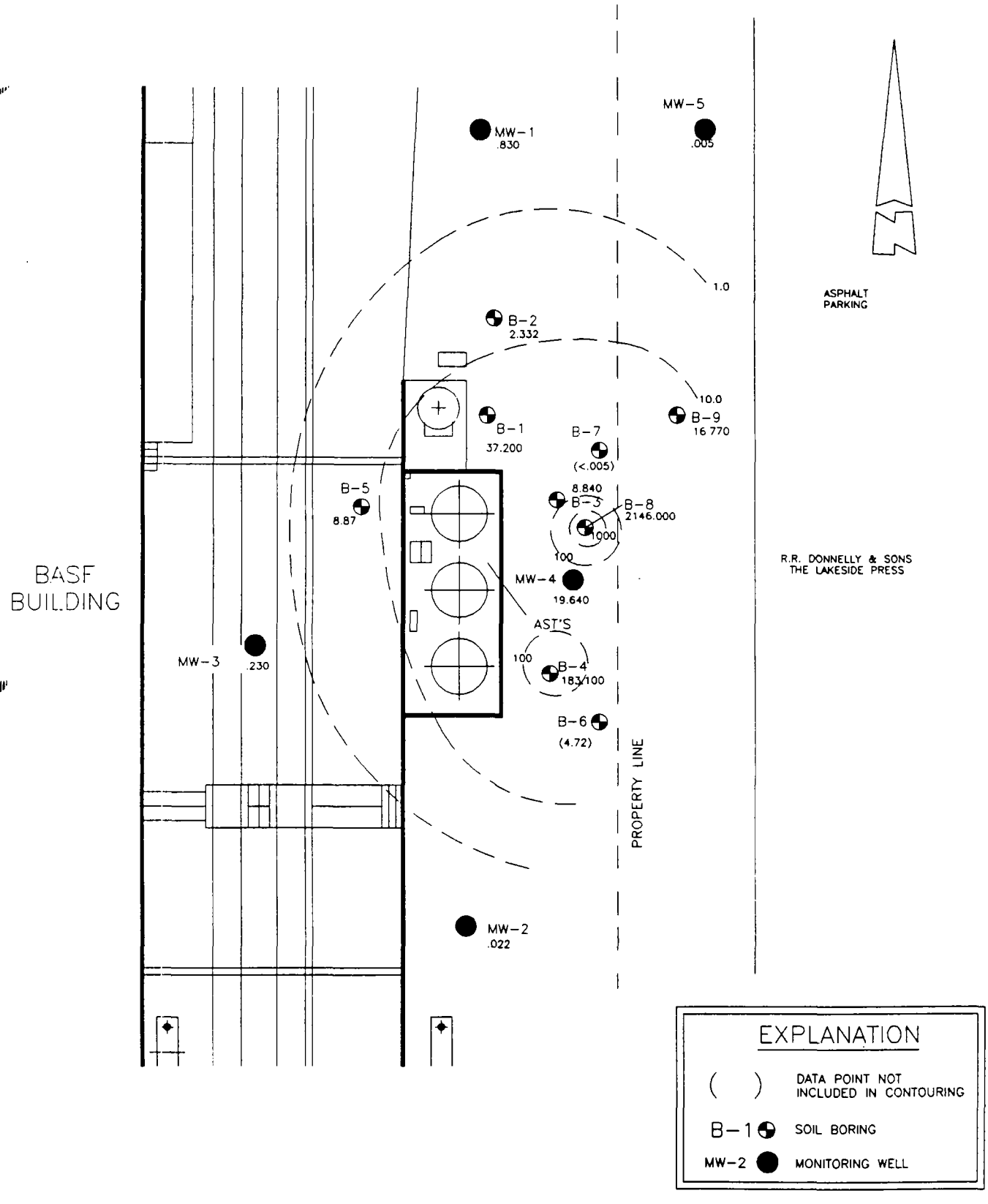
Following an appropriate settling time (30 minutes for MW-5, 15 hours for MW-4), groundwater samples were collected from the two (2) new monitoring wells using fresh nylon rope and a clear acrylic bailer. Before sampling, each well was purged of approximately three (3) volumes of water to ensure a representative sample. Purge water was collected into drums and is currently stored on-site for future disposal. Sampling equipment was decontaminated by washing with trisodium phosphate detergent and distilled water rinse between monitoring wells. Upon collection, the groundwater samples were submitted to the ATEC laboratory for BTEX analysis.

4.0 ANALYTICAL RESULTS

A total of six (6) soil samples and three (3) groundwater samples were collected, preserved, and transported to the ATEC laboratory for analysis. All accepted quality assurance/quality control (QA/QC) procedures for sample collection, preservation, and transport were observed. All laboratory tests were performed in accordance with SW 846, Analytical Test Methods. Laboratory tests on water samples were analyzed in accordance with EPA Method 624. A copy of test results and analytical methods is provided in Appendix C.

4.1 Soil Analytical Results

Table 1 details laboratory analysis results for total BTEX in the six (6) soil samples collected. Figure 4 presents these results in the form of a total BTEX isocon map, and includes data from the other monitoring wells and soil borings installed during ATEC Project Number 21-97671. It should be noted that the data from borings B-6 and B-7 was not used to generate Figure 4, since these samples were collected from a relatively shallow depth.



TCTAL BTEX CONC. IN SOILS (PPM)
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-07184
SCALE	1" = 30'
FIGURE NO.	4

ATEC

Table 1
Total BTEX (soils)

Sample I.D. (depth/ft)	Total BTEX	Quantitation Limit
B-6 (3.5 - 5.0)	4.720	.005
B-7 (1.0 - 2.5)	>.005	.005
B-8 (6.0 - 7.5)	2146.000	.210
B-9 (6.0 - 7.5)	16.770	.050
MW-4 (6.0 - 7.5)	19.640	.050
MW-5 (6.0 - 7.5)	.005	.005

Concentrations reported in mg/kg, or parts per million (ppm)

4.2 Groundwater Analytical Results

BTEX analysis in water is used as an indicator of organic constituents in the dissolved phase. Toluene was detected in both of the groundwater samples collected on May 9, 1990. The amount detected was near the quantitation limit of the analysis instrument of .005 ppm in MW-5 (measured concentration .009 ppm). However, the groundwater sample from MW-4 exhibited a total BTEX concentration of 83.400 ppm. This monitoring well was sampled on May 31, 1990 to verify the elevated concentrations. This sample exhibited a total BTEX concentration of 27.060 ppm. Table 2 summarizes laboratory results for the three (3) groundwater samples collected.

Table 2
BTEX Constituents (Groundwater)

	Sample I.D.		
Constituent	**MW-4 (May 9, 1990)**	**MW-4 (May 31, 1990)**	**MW-5 (May 9, 1990)**
Benzene	<.500*	<.050*	<.005*
Toluene	81.000	26.000	.009
Ethylbenzene	<.500	.160	<.005
Xylene	2.100	.900	<.005*
Quantitation Limit	.005	.050	.005

Concentrations reported in parts per million (ppm)
*Analyte detected below quantitation limits

5.0 CONCLUSIONS AND RECOMMENDATIONS

The purpose of this subsurface investigation was to determine the extent of organic constituents present in the subsurface at the site. To achieve this objective, soil and groundwater samples were collected from six (6) soil borings and two (2) monitoring wells in addition to previous samples collected during ATEC Project Number 21-97681. All soil and groundwater samples were analyzed for BTEX content at the ATEC Analytical Laboratory in Indianapolis, Indiana.

Based upon data collection by ATEC, elevated levels of BTEX in the shallow soil and groundwater were discovered in the vicinity of the AST pad. Laboratory analysis of soil and groundwater suggests that the distribution of organic constituents appears to be limited to an area immediately east

of the AST pad. The highest level of organic constituents in the soil was encountered just above the water table in a limited lateral zone at/or near the eastern property line. The highest level of organics in the groundwater was encountered in the same general area.

Based upon the findings of this investigation and the previous investigation, ATEC concludes that the soil and groundwater at the project site have been impacted by a BTEX release of unknown origin and duration. Therefore, ATEC recommends remediation of the affected media according to applicable federal and state standards. Methods of remediation shall be itemized at a later date, and addressed under separate cover.

6.0 QUALIFICATIONS

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

The work performed in conjunction with this assessment and the data developed, are intended as a description of available information at the dates and locations given. This report

does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

The present study included a limited number of borings across the entire project site. The conclusions drawn from the investigation are considered reliable, however, there may exist localized variations in subsurface conditions that have not been completely defined at this time. It should be noted that subsurface conditions may be better delineated with increased subsurface exploration including test pits, soil borings with sample collection and laboratory testing, and surface geophysical survey techniques.

APPENDIX A

SOIL BORING LOGS

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. MW-4

CLIENT	BASF Corporation	JOB NO.	21-07184
PROJECT NAME	Additional Subsurface Investigation	START DATE	05/08/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	East of the AST containment wall	ROCK CORE DIA.	IN.
FOREMAN	H. Turner	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Brown moist medium stiff SANDY SILTY CLAY (CL) with Gravel	2.0		1	4/5/5	80	50	
Brown moist loose fine Sand (SW)	3.25						
Gray moist mecium dense fine to coarse Sand and Gravel (SW)		5	2	7/8/12	50	60	
Wet @ 4.6'			3*	5/5/6	66	400	Strong toluene odor
		10	4	22/12/10	100	200	Black stain @ 9.75'
Bottom of test boring @ 12.0'		15					
							*Soil sample obtained for BTX&E analysis
							Well materials installed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 4.6 FT
AT COMPLETION 3.6 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

MW-4

DEPTH,

SOIL PROFILE

Brown moist medium stiff SANDY SILTY CLAY (CL) with Gravel

2.0'

Brown moist loose fine Sand (SW)

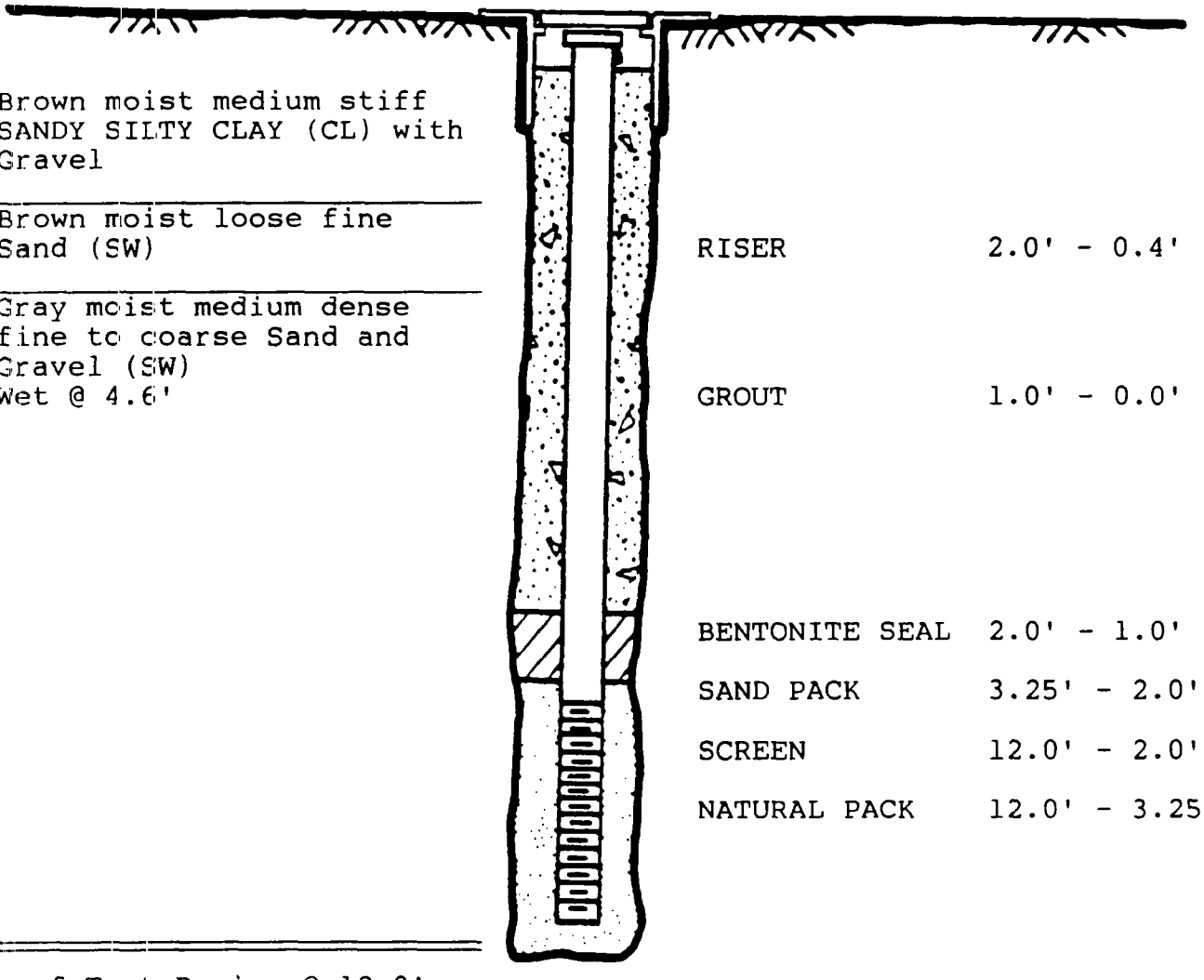
3.25'

Gray moist medium dense fine to coarse Sand and Gravel (SW)
Wet @ 4.6'

Bottom of Test Boring @ 12.0'

CONSTRUCTION DETAILS

MANHOLE AND LOCKING CAP



RISER	2.0' - 0.4'
GROUT	1.0' - 0.0'
BENTONITE SEAL	2.0' - 1.0'
SAND PACK	3.25' - 2.0'
SCREEN	12.0' - 2.0'
NATURAL PACK	12.0' - 3.25'

Construction Material:	PVC Schedule 40
Well Diameter:	4 inches
Screen Length:	10.0 ft
Slot Size:	0.010
Development Method:	Drill Rig Pump
Development Duration:	0.3 hr (55 gallon)

Groundwater Level Observations

Date	Elev., ft
5/9/90	3.1

MONITORING WELL DETAILS

PROJECT NO. 21-07184

SCALE None

ATEC

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. MW-5

CLIENT	BASF Corporation	JOB NO.	21-07184
PROJECT NAME	Additional Subsurface Investigation	START DATE	05/09/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	Donnelly property north of B-9	ROCK CORE DIA.	IN.
FOREMAN	H. Turner	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil							
			1	4/5/5	100	ND	
	4.5						
		5	2	8/5/5	50	ND	
Gray very moist loose fine to coarse Sand and Gravel (SP)	6.75						
Gray wet loose fine Sand (SW) with trace Silt	8.0		3*	4/5/4	100	ND	
Gray wet dense fine to coarse Sand and Gravel (SP)		10	4	10/9/14	90	ND	Spoon refusal @ 11.8'
			5	40/50/.3	90	ND	Large boulder
Bottom of test boring @ 13.0'		15					

*Soil sample obtained for BTX&E analysis

Well materials installed in boring

WATER LEVEL OBSERVATIONS
NOTED ON RODS 6.0 FT
AT COMPLETION FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

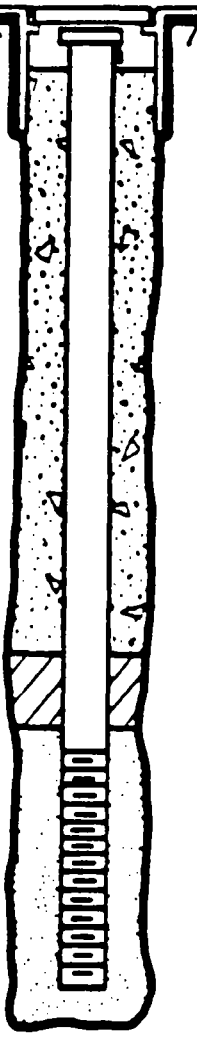
MW-5

DEPTH,

SOIL PROFILE

CONSTRUCTION DETAILS

MANHOLE AND LOCKING CAP



Topsoil

4.5'

Gray very moist loose fine to coarse Sand and Gravel (SP)

6.75'

Gray wet loose fine Sand (SW) with trace Silt

8.0'

Gray wet dense fine to coarse Sand and Gravel (SP)

Bottom of Test Boring @ 13.0'

RISER	2.5' - 0.3'
GROUT	0.75' - 0.0'
BENTONITE SEAL	1.5' - 0.75'
SAND PACK	2.5' - 1.5'
SCREEN	12.5' - 2.5'
NATURAL PACK	12.5' - 2.5'

Construction Material:	PVC Schedule 40
Well Diameter:	4 inches
Screen Length:	10.0 ft
Slot Size:	0.010
Development Method:	Drill Rig Pump
Development Duration:	2.5 hours

Groundwater Level Observations

Date	Elev., ft
5/11/90	3.57

MONITORING WELL DETAILS

PROJECT NO. 21-07184

SCALE None

ATEC

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-6

CLIENT	BASF Corporation	JOB NO.	21-07184
PROJECT NAME	Additional Subsurface Investigation	START DATE	05/08/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	Southeast of AST containment wall;adjacent to property line fence	ROCK CORE DIA.	IN.
FOREMAN	H. Turner	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Brown moist stiff SANDY SILTY CLAY (CL) with Gravel	3.0		1	2/4/7	50	ND	
Gray wet medium dense fine to coarse Sand and Gravel (SP)		5	2*	8/10/12	75	50	Black stain @ 4.75' No hydrocarbon odors noticed
Bottom of test boring @ 5.0'		10					
		15					*Soil sample obtained for BTX&E analysis Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 3.5 FT
AT COMPLETION 3.65 FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-7

CLIENT BASF Corporation
PROJECT NAME Additional Subsurface Investigation
PROJECT LOCATION Warsaw, Indiana
BORING LOCATION Northeast of AST containment wall;adjacent to property line fence
FOREMAN H. Turner
INSPECTOR D. Ben Chandler, Jr.

JOB NO. 21-07184
START DATE 05/08/90
BORING METHOD HSA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Dark brown moist medium stiff SILTY CLAYEY SAND (SC) with Travel	2.25		1*	2/3/6	50	80	
Brown very moist loose fine to coarse Sand and Gravel (SP)		5	2	9/9/12	50	30	No hydrocarbon or soil staining present
Bottom of test boring @ 5.0'		10					
		15					*Soil sample obtained for BTX&E analysis Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
NOTED ON RODS 4.25 FT
AT COMPLETION 3.75 FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*) BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**) TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-8

CLIENT	BASF Corporation	JOB NO.	21-07184
PROJECT NAME	Additional Subsurface Investigation	START DATE	05/09/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	East of the AST containment wall/between MW-4 and B-7	ROCK CORE DIA.	IN.
FOREMAN	H. Turner	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Brown moist medium stiff SANDY SILTY CLAY (CL) with Gravel	2.25		1	4/5/5	75	3.0	
Brown moist loose fine to coarse Sand and Gravel (SW)			2	5/7/11	75	2.0	
Wet @ 4.0'		5					Strong toluene odor
			3*	11/15/16	75	400	@6.0 to 7.5'
	9.75						Heavy black staining
Dark brown wet medium dense fine Sand (SW)		10	4	12/12/13	75	50	below 8.5'
Bottom of test boring @ 10.0'							
		15					
							*Soil sample obtained for BTX&E analysis
							Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
WHILE DRILLING ON RODS 4.0 FT
AT COMPLETION FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. B-9

CLIENT	BASF Corporation	JOB NO.	21-07184
PROJECT NAME	Additional Subsurface Investigation	START DATE	05/09/90
PROJECT LOCATION	Warsaw, Indiana	BORING METHOD	HSA
BORING LOCATION	Donnelly property, northeast of B-7	ROCK CORE DIA.	IN.
FOREMAN	H. Turner	SHELBY TUBE DIA	IN.
INSPECTOR	D. Ben Chandler, Jr.		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TPV ppm (**)	REMARKS
Topsoil	1.5						
Brown moist medium stiff SANDY SILTY CLAY (CL) with Gravel	4.0		1	6/4/4	80		
Brown very moist medium stiff fine to coarse Sand and Gravel (SP)		5	2	5/10/13	66		
Wet @ 6.5'			3*	11/11/14	90	300	Strong toluene odor @ 3rd interval
		10	4	9/8/7	100	70	Heavy black staining below 8.5'
Bottom of test boring @ 10.0'							
		15					
							*Soil sample obtained for BTX&E analysis
							Boring backfilled with auger cuttings upon completion

WATER LEVEL OBSERVATIONS
WHILE DRILLING ON RODS 6.5 FT
AT COMPLETION FT
AFTER HRS. FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TPV-Total Photoionizable Vapors ppm (parts per million)

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density	
Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Relative Proportions	
Descriptive Term	Percent
Trace	1 -10
Little	11-20
Some	21-35
And	36-50

Particle Size Identification		
Boulders	-8 inch diameter or more	
Cobbles	-3 to 8 inch diameter	
Gravel	-Coarse	-1 to 3 inch
	Medium	-½ to 1 inch
	Fine	-¼ to ½ inch
Sand	-Coarse	2.00mm to ¼ inch (dia. of pencil lead)
	Medium	0.42 to 2.00mm (dia. of broom straw)
	Fine	0.074 to 0.42mm (Dia. of human hair)
Silt		0.074 to 0.002mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	
ry Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	-11 to 15 blows/ft.
Very Stiff	-16 top 30 blows/ft.
Hard	-31 blows/ft. or more

Plasticity	
Degree of Plasticity	Plasticity Index
None to slight	0- 4
Slight	5- 7
Medium	8-22
High to Very High	over 22

Classification on logs are made by visual inspection of samples.

Standard Penetration Test — Driving a 2.0" O.D., 1-3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for ATEC to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6.0 inches of penetration on the drill log (Example — 6/8/9). The standard penetration test result can be obtained by adding the last two figures (i.e. 8+ 9 = 17 blows/ft.). (ASTM D-1586-67)

Strata Changes — In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (_____) represents an actually observed change, a dashed line (_ _ _ _) represents an estimated change.

Ground Water observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

APPENDIX B

SCREENING DEVICE

H-Nu

ATEC used a portable instrument called an H-Nu to measure TPVs emitted from the soil samples. The H-Nu is equipped with a small pump which continuously draws air samples into an ionization chamber which is flooded with ultra-violet light. Ionization of the vapors within this chamber results in the generation of an electric current which relates to the concentration of vapors below this energy. Most of the light permanent gases (such as those in ambient air) have ionization potentials at 12 eV or more while many organic chemicals (benzene, xylene, toluene, etc.) have ionization potentials below 10.5 eV.

For the purposes of this investigation, the H-Nu was used as a screening tool for the presence of photo-ionizable contaminants. Following extrusion the sample was placed in a plastic sample bag and the pump inlet for the H-Nu was placed in the bag for measurement. The highest value recorded during this procedure was recorded on the boring logs. For screening purposes, ATEC relies on the calibration performed on the instrument at the factory. The factory calibrates the instrument to 100 ppm benzene, therefore, values reported on the boring logs represent ppm as benzene. In screening applications the actual numerical values recorded are of secondary importance, especially since there are no established United States Environmental Protection Agency (U.S. EPA) and the Indiana Department of Environmental Management (IDEM) standards for TPVs. The relative magnitude of the values between sampling sites is considered to be of primary importance in screening for the presence of contaminated samples. In general, background levels of TPVs at an undeveloped site would be 25 ppm or less while background values at an industrial site or, in this case, a gasoline station would be 50 to 100 ppm.

APPENDIX C
LABORATORY RESULTS

ATEC Environmental Consultants
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990, FAX # [317] 849-4278

May 29, 1990

Mr. Kelly Kading
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: Four Soil/One Water BTEX
SW 846 Method 8240
U.S. EPA Method 624
BASF Corporation
ATEC Project Number 21-07184

Dear Mr. Kading:

Enclosed are the results of the Organic Analyses for the one water and four soil samples which were submitted to the ATEC Environmental/ Analytical Testing Division on May 14, 1990, on behalf of BASF. These samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 and U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/feb

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: B-6 (3.5-5.0)
Sample Matrix: Soil
Date Sample Collected: May 8, 1990
Date Sample Received: May 14, 1990
Date Sample Analyzed: May 17, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005120-1

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	2,100	5
Ethylbenzene	100-41-4	420	5
Total Xylenes		2,200	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon, M. McGill, B. Keller
Verified: B. Keller
Date Reported: May 22, 1990

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: B-9 (6.0-7.5)
Sample Matrix: Soil
Date Sample Collected: May 9, 1990
Date Sample Received: May 14, 1990
Date Sample Analyzed: May 17, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005120-2

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<50	50
Toluene	108-88-3	16,000	50
Ethylbenzene	100-41-4	160	50
Total Xylenes		610	50

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: May 22, 1990

Respectfully submitted,

Keith S. Klein
Environmental/Analytical Testing Division

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: MW-4 (6.0-7.5)
Sample Matrix: Soil
Date Sample Collected: May 8, 1990
Date Sample Received: May 14, 1990
Date Sample Analyzed: May 17, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005120-3

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
enzene	71-43-2	<50*	50
Toluene	108-88-3	19,000	50
Ethylbenzene	100-41-4	130	50
Total Xylenes		510	50

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: May 22, 1990

Respectfully submitted,

Environmental/Analytical Testing Division

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: MW-5 (6.0-7.5)
Sample Matrix: Soil
Date Sample Collected: May 9, 1990
Date Sample Received: May 14, 1990
Date Sample Analyzed: May 17, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005120-4

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
nzene	71-43-2	<5	5
Toluene	108-88-3	5	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: May 22, 1990

Respectfully submitted,

Keith S Blair

Environmental/Analytical Testing Division

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: MW-5
Sample Matrix: Water
Date Sample Collected: May 11, 1990
Date Sample Received: May 14, 1990
Date Sample Analyzed: May 17, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005120-5

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<5*	5
Toluene	108-88-3	9	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5*	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: May 22, 1990

Respectfully submitted,

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO. 21-07184 | PROJECT NAME ADDITIONAL SUBSURFACE INVESTIGATION | CLIENT BASF CORPORATION | LAB PROJ. NO. 9005120

SAMPLERS: (Signature) D. Ben Chandler Jr.

SAMPLING METHOD (SPLIT SPOON) / BAILER

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARK
B-6 (3.5-5.0)	5/8/90		✓			✓				✓		1	-1		✓							
B-7 (6.0 TO 7.5)	5/9/90		✓			✓				✓		1	-2		✓							
MW-5 (6.0-7.5')	5/9/90		✓			✓				✓		1	-4		✓							
MW-5	5/11/90			✓	✓					✓		2	-5		✓							
MW-4 (6.0-7.5)	5/8/90		✓			✓				✓		1	-3		✓							

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
D. Ben Chandler Jr.	5/14/90 8:40 AM				

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:
		B Hudson	9/14/90 8:43	

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

ATEC Environmental Consultants
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990, FAX # [317] 849-4278

June 5, 1990

Mr. Kelly Kading
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: One Water BTEX
U.S. EPA Method 624
Forty-eight Hour Rush
BASF Corporation
ATEC Project Number 21-07184

Dear Mr. Kading:

Enclosed are the results of the Organic Analysis for the water sample which was submitted to the ATEC Environmental/Analytical Testing Division on May 31, 1990, on behalf of the the BASF Corporation. This sample was analyzed on a Finnigan Incos 50 GC/MS/DS system, complete with Superincos Software, via U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline
Environmental/Analytical
Testing Division

SK/feb

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: MW-4
Sample Matrix: Water
Date Sample Collected: May 31, 1990
Date Sample Received: June 1, 1990
Date Sample Analyzed: June 5, 1990
Analytical Equipment: Incos BV

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9006003-1D

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<50*	50
Toluene	108-88-3	26,000	50
Ethylbenzene	100-41-4	160	50
Total Xylenes		900	50

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: M. McGill
Verified: B. Keller
Date Reported: June 5, 1990

Respectfully submitted,

Environmental/Analytical Testing Division

PROJ. NO. 2107184 | PROJECT NAME ADDITIONAL SUBSURFACE INVESTIGATION | CLIENT BASF CORP.

LAB PROJ. NO. 9006003

SAMPLERS: (Signature) D. Ben Chandler Jr.

SAMPLING METHOD: BAILER

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARKS
MW-4	5/31/90			✓	✓					✓		2	-1		✓							

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
D Ben Chandler Jr.	6/1/90 8:25am				

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:
		Terry M Perin	6-1-90 8:25am	

ATEC Environmental Consultants
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990, FAX # [317] 849-4278

May 24, 1990

Mr. Kelly Kading
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: One Soil/One Water BTEX
SW 846 Method 8240
U.S. EPA Method 624
Twenty-four Hour Rush (Soil)
Verbals Reported May 10, 1990 (Sandi)
BASF Corporation
ATEC Project Number 21-07184

Dear Mr. Kading:

Enclosed are the results of the Organic Analyses for the one water and one soil sample which was submitted to the ATEC Environmental/ Analytical Testing Division on May 9, 1990, on behalf of BASF Corporation. These samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 and U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/feb

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: B-8
Sample Matrix: Soil
Date Sample Collected: May 9, 1990
Date Sample Received: May 9, 1990
Date Sample Analyzed: May 9, 1990
Analytical Equipment: 1020A

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005086-1

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<210*	210
Toluene	108-88-3	2,100,000	210
Ethylbenzene	100-41-4	11,000	210
Total Xylenes		35,000	210

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: T. Harrison
Verified: B. Keller
Date Reported: May 10, 1990

Respectfully submitted,

Keith S Kline

Environmental/Analytical Testing Division

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: MW-4
Sample Matrix: Water
Date Sample Collected: May 9, 1990
Date Sample Received: May 9, 1990
Date Sample Analyzed: May 23, 1990
Analytical Equipment: 1020A

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005086-2

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Benzene	71-43-2	<500*	500
Toluene	108-88-3	81,000	500
Ethylbenzene	100-41-4	<500	500
Total Xylenes		2,100	500

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: U.S. EPA Method 624

Analyst: T. Harrison
Verified: M. McGill
Date Reported: May 24, 1990

Respectfully submitted,

Keith S. Kline

Environmental/Analytical Testing Division

PROJ. NO. 21-07184

PROJECT NAME ADDITIONAL SUBSURFACE INVESTIGATION

CLIENT BASF CORP.

LAB PROJ. NO. 9005086

SAMPLERS: (Signature) D Ben Chandler Jr.

SAMPLING METHOD SPLIT SPOON / BAILER

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARKS
R-8 (6.0-7.5)	5/1/90		✓			✓				✓		1	-1		✓							
MW-4	5/9/90			✓	✓					✓		2	-2		✓							HOLD KwK

ATEC Environmental Consultants

Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
D. Ben Chandler Jr.	5/9/90 11:40				
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:	
	5/9/90 14:38	B. Hudson	5/9/90 2:38		

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990, FAX # [317] 849-4278

May 10, 1990

Mr. Kelly Kading
ATEC Environmental Consultants
5150 E. 65th Street
Indianapolis, IN 46220

Re: One Soil BTEX
SW 846 Method 8240
Same Day Rush
Verbals Reported May 8, 1990
BASF Corporation
ATEC Project Number 21-07184

Dear Mr. Kading:

Enclosed are the results of the Organic Analysis for the soil sample which was submitted to the ATEC Environmental/Analytical Testing Division on May 8, 1990, on behalf of the BASF Corporation. This sample was analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline
Environmental/Analytical
Testing Division

KSK/feb

Client: BASF Corporation
Client Address: P.O. Box 287
Old Road West
Warsaw, IN 46580

Client Project Number: 21-07184
Client Sample Identification: B-7 (1.0-2.5)
Sample Matrix: Soil
Date Sample Collected: May 8, 1990
Date Sample Received: May 8, 1990
Date Sample Analyzed: May 8, 1990
Analytical Equipment: 1020B

PURGEABLE AROMATICS
ANALYTICAL RESULTS

ATEC Lab No. 9005069-1

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5*	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes		<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: J. Rigdon
Verified: B. Keller
Date Reported: May 9, 1990

Respectfully submitted,

Keith S Klein

Environmental/Analytical Testing Division

CHAIN OF CUSTODY RECORD

PROJ. NO. 2107184

PROJECT NAME ADDITIONAL SUBSURFACE INVESTIGAT

CLIENT BASF CORPORATION

AB PROJ. NO. 9005069

SAMPLERS: (Signature) D. Ben Chandler Jr.

SAMPLING METHOD SPLITSPOON

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	VOLATILE ORGANICS	BTX & E	TOTAL HYDROCARBONS	PCB'S	E.P. TOXIC METALS	TOTAL METALS (8)	IGNITABILITY		SAMPLE LOCATION / REMARKS
B-7(10-25)	5/8/90		✓			✓				✓		1	-1		✓							

LABORATORY ANALYSIS

Relinquished by: (Signature) D. Ben Chandler Jr. — Date / Time 5/8/90 11:30 am — Received by: (Signature) Charles D. Cashman

Relinquished by: (Signature) — Date / Time — Received by: (Signature)

Relinquished by: (Signature) Charles D. Cashman — Date / Time 5/8/90 2:09 pm — Received for Laboratory by: (Signature) David Barga — Date / Time 5-8-90 2:10 pm — Project Manager / Phone #:

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

File Kendall Co
Includ follows to
891113
Ref 7

ENVIRONMENTAL SITE ASSESSMENT
BASF FACILITY
OLD ROAD 30 WEST
WARSAW, INDIANA

HERITAGE®

HERITAGE REMEDIATION ENGINEERING, INC.

EXECUTIVE SUMMARY

The objective of this project was to assess the extent of benzene, toluene, ethylbenzene or xylene (BTEX) within the soil matrix and to provide data applicable to the installation of a properly engineered pumping system to extract affected ground water from the impacted area.

Initially a 72 hour pumping test was proposed for aquifer characterization but this was not possible due to lack of a permissable discharge point. Individual slug/recovery tests were performed on each well to collect as much data as possible within the given constraints. The results indicate hydraulic conductivities around 3.0 X 10^{-2} ft/min except in MW-5 which showed a result one full order of magnitude lower.

Ground-water samples were retrieved from five of the wells and only two revealed detectable concentrations of BTEX. Of these only MW-4 showed concentrations of all BTEX parameters (56.8 ppm total BTEX) while MW-3 showed only a small concentration of toluene (14 ppb).

The results of a soil vapor survey were inconclusive due to the extremely high water table present in the area of concern. Soil pore spaces available for vapor movement (and detection) were filled by ground water due to a combination of capillary water and surface infiltration. However, the analyses of vapors extracted from the upper two to three feet of soils indicate no toluene present although several unidentified chemicals were present in samples SG-1 and SG-2 at very low concentrations (less than 5 ppb). Benzene was detected in all samples, including the sample blanks, and were determined to be background levels from other sources.

ENVIRONMENTAL SITE ASSESSMENT

BASF FACILITY
OLD ROAD 30 WEST
WARSAW, INDIANA

PREPARED FOR:

BASF CORPORATION
8 CAMPUS DRIVE
PARSIPPANY, NEW JERSEY 07054

PREPARED BY:

HERITAGE REMEDIATION/ENGINEERING, INC.
5656 OPPORTUNITY DRIVE
TOLEDO, OHIO 43612

July 23, 1991

TABLE OF CONTENTS

APPENDICES

Appendix

1.0 INTRODUCTION

This project was initiated due to a suspected surface release of a small volume of toluene based solvent during routine maintenence (exterior painting) of the above ground storage tanks located next to the area of concern. An assessment of the soils and ground water was undertaken to determine the extent of the impacted area.

Preliminary testing of soils in the area of concern by others indicated the presence of toluene and one or more volatiles in the soils ranging from below 1 ppm to greater than 2000 ppm. The area affected appeared to be centered around BH-8 and MW-4 located just to the east of three above ground storage tanks on the east side of the property. These values were obtained from samples taken in May of 1990.

As a result of the discovery of these chemical parameters, additional assessment was requested to determine the hydraulic characteristics of the affected soils and to determine the extent of vapor phase migration of the volatile components present.

HR/E provided aquifer characterization through slug recovery testing of all wells present and retrieved samples for analyses. In addition, a soil vapor survey was attempted to delineate the extent of soils affected by vapor migration.

1.1 SITE BACKGROUND

The site involved in this study is described in the following sections.

1.1.1 Site Location

This site is situated on the south side of Old Route 30 north of Warsaw, Indiana (see Figure 1). North, south and west of the site is predominantly open land while to the east is the R.R. Donnelly & Sons, a large industrial facility involved in printing operations. The land to the west is presently under construction for athletic fields and facilities.

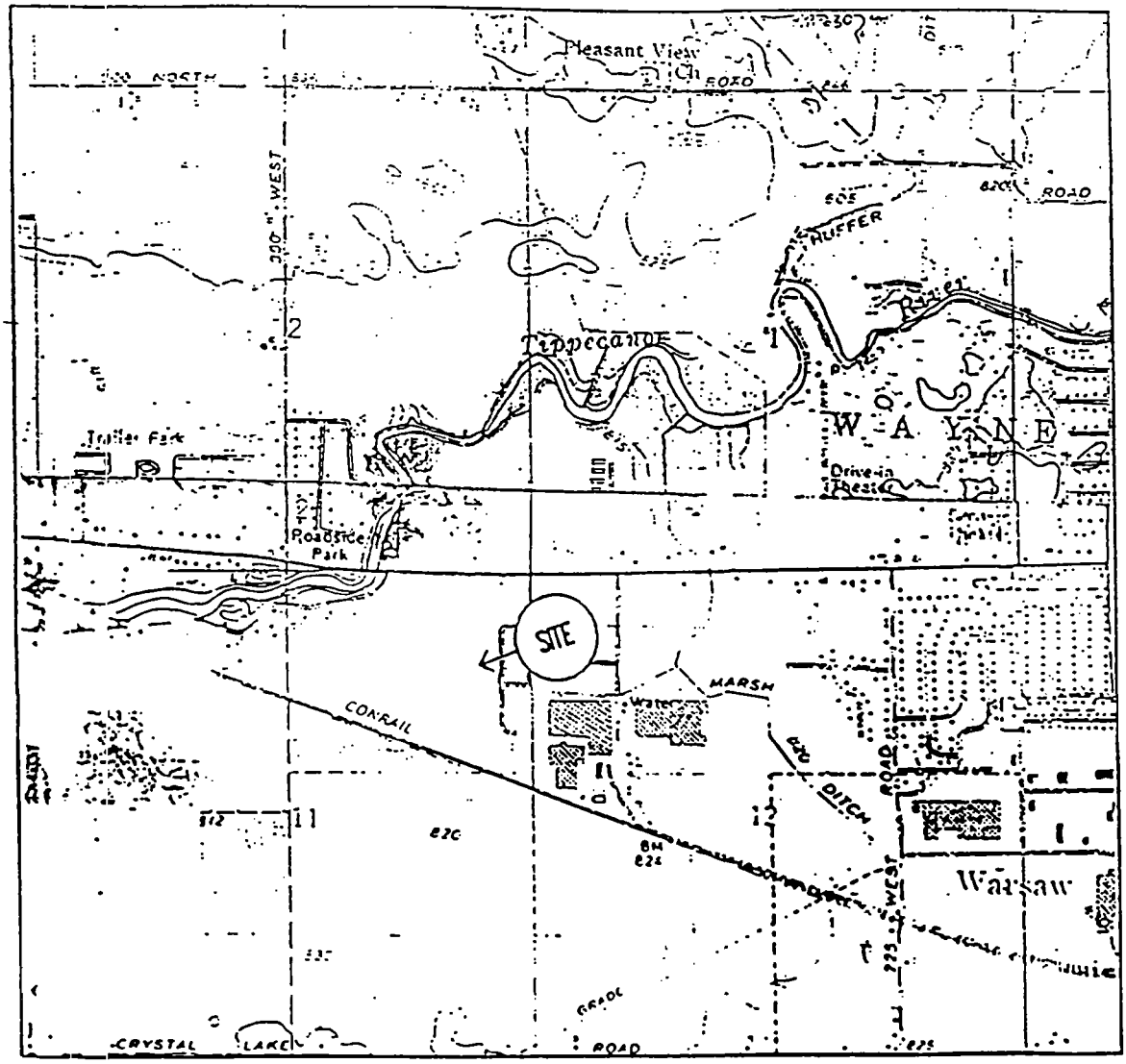


Figure 1

SITE LOCATION MAP
BASF CORPORATION FACILITY
WARSAW, INDIANA

1.1.2 Water Resources

Ground water is the predominant source of potable water for this region. The wells are generally set in highly productive glaciofluvial or glacial outwash deposits of sand and gravel usually within 60 feet of surface. These aquifers are, for the most part, unconfined.

The Tippecanoe River is located a few hundred yards to the northwest of the site and is the apparent receptor for water table ground-water flow in this area. Ground water is first encountered at a depth of approximately 3.5 feet below grade in the five wells present on site and exists as a unconfined water table.

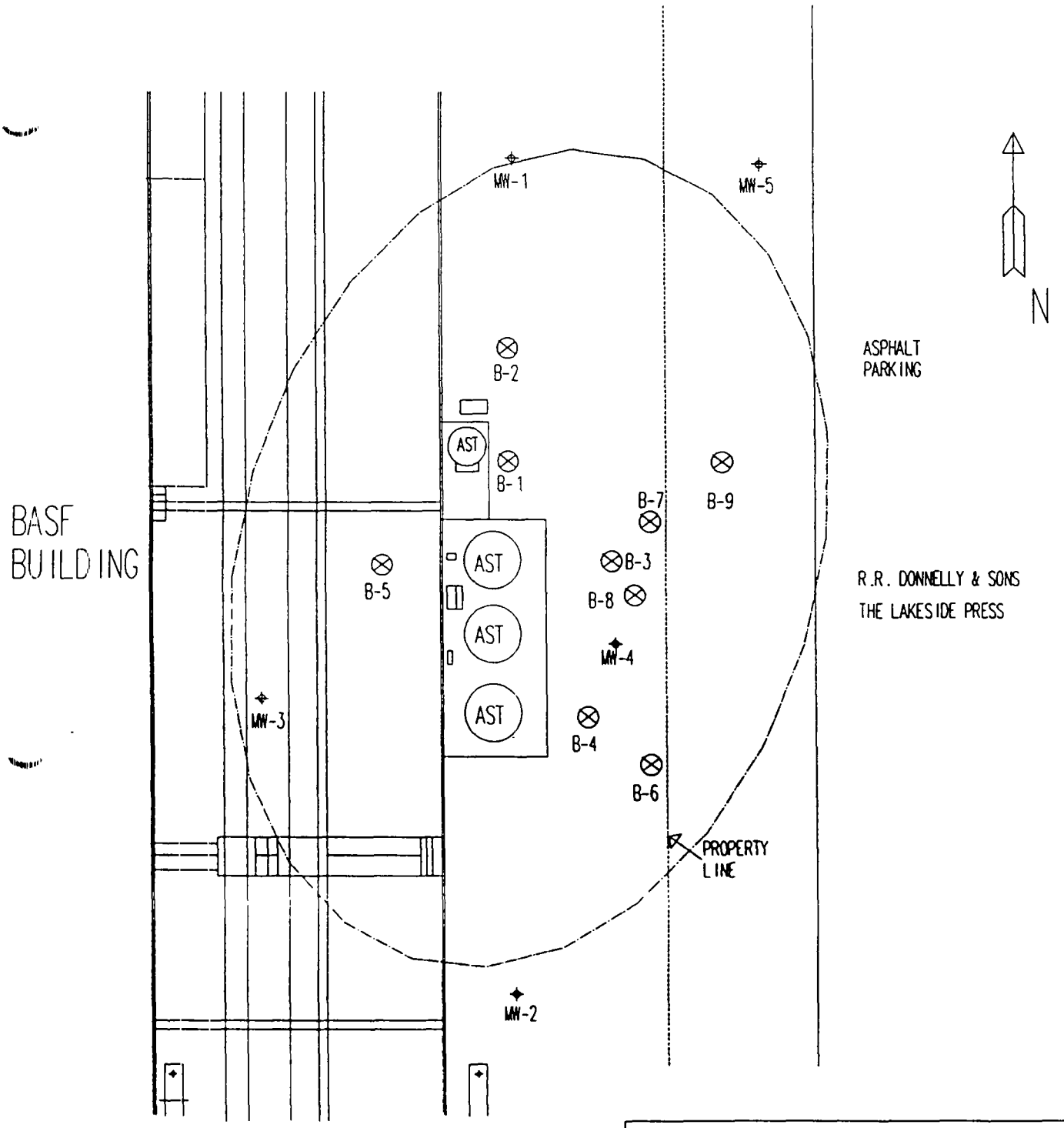
1.1.3 Climatological Conditions

The average winter temperature in Kosciusko County is 26 degrees F and summer temperatures average 70 degrees, with an average daily maximum of 82 degrees. The total annual precipitation is 35.5 inches with the majority of this (60%) falling between April and September.

1.2 PREVIOUS INVESTIGATION

Preliminary testing of soils was provided by ATEC Associates in May of 1990. The initial assessment consisted of nine soil borings and five ground-water monitoring wells. The results indicated the presence of toluene and one or more volatiles in the soils ranging from below 1 ppm to greater than 2000 ppm. The area affected appeared to be centered around BH-8 and MW-4 located just to the east of three above ground storage tanks on the east side of the property (See Figure 2). These values were obtained from samples taken in May of 1990.

At that time ground-water flow was determined to be to the northeast towards the Tippicanoe River.



MW-2 MONITOR WELL

⊗ ATEC BORING LOCATION

BASF PLANT		
WARSAW, INDIANA		
FIGURE 2 - AREAL EXTENT OF BTEX IN SOIL		
HERITAGE REMEDIATION/ENGINEERING, INC. 5656 OPPORTUNITY DRIVE TOLEDO, OHIO 43612		HERITAGE
REVISION: 003	DATE: 6-4-91	DRAWN BY: HSW
SCALE: 1" = 30'	DWG NO.	APPROVED BY: RRB

2.0 HERITAGE INVESTIGATION

HR/E conducted additional testing to calculate the hydraulic characteristics of the soils in the affected area and to provide further delineation of the extent of vapor phase migration of BTEX constituents in the soils.

2.1 METHODS AND PROCEDURES

The following methods and procedures were followed by HR/E personnel to complete this phase of the investigation.

2.1.1 Soil Vapor Survey

A soil vapor survey was initiated by HR/E in April of 1991 to assess the extent of soils affected by BTEX by analyzing soil pore vapors for the presence of toluene. A 1/2 inch diameter stainless steel probe was driven into the soils to the desired depth (3 feet) and then pulled back 3 inches to expose a small screened tip at the drive end of the rods.

The rods were purged of static air using a portable vacuum pump attached to the above ground end of the rods by teflon tubing. An air sample was retrieved from the soils through the rods by piercing the teflon tube immediatly above the stainless steel rods with a glass laboratory syringe and extracting the sample. The sample was immediately injected into a 511 thermal electron gas chromatograph (GC) Model AID 210 to analyze its contents.

The probe and rods were decontaminated between sample locations using a soap and water wash and distilled water rinse. Sample blanks made up of anbient air were run through the GC between samples as a quality control of results. These samples showed a benzene peak on the chromatographic recorder and therefore this was considered to be background interference.

2.1.2 Pump Testing (MW-4), Slug Recovery Tests

Initial plans to provide a long term pump test of MW-4 were abandoned due

to the lack of a permissible discharge point. To provide as much data as possible under the no discharge constraint, slug recovery tests were performed on all five monitoring wells.

This was accomplished using a Hermit Datalogger and a pressure transducer. The transducer was installed and one "slug" of water (1.46 gallons) was removed from the well while the datalogger recorded water level changes on a logarithmic time scale as the levels returned to static conditions.

2.1.3 Ground-Water Sampling

Prior to taking samples from the five monitoring wells for analysis, each well was purged of stagnant well casing water by bailing. A minimum of three well casing volumes of water was removed from each well during purging activities. Ground-water samples were retrieved from each well with dedicated PVC bailers and transferred into two 40 ml volatile organic analysis (VOA) vials per well for BTEX analysis.

The water samples were kept at approximately 4 degrees C in a cooler until they were transferred to the laboratory. Chain-of-custody forms were filled out in the field and accompanied the samples during shipment to the laboratory. All purge water was placed into one 55 gallon drum and staged on-site for future disposal.

2.1.4 Sample Analyses

Chemical analyses were performed on five ground-water samples to determine the concentrations of BTEX using the following methodology:

a. benzene, toluene, ethylbenzene, and xylenes (BTEX) (EPA Method 601/602)

All laboratory analytical services were provided by Jones and Henry Laboratories in Northwood, Ohio.

2.2 RESULTS OF SITE INVESTIGATION

The following sections describe the results obtained from the work previously described.

2.2.1 Soil Vapor Survey Results

The analyses of vapors extracted from the upper vadose zone indicate no detectable concentrations of toluene in 13 of the 15 sample points checked (See Figure 3). Two points (SG-1 and SG-3) showed evidence of volatiles present, however, the peaks appearing on the chromatograph recorder were not identifiable with any degree of certainty. These peaks were clustered around the position of toluene on the recorder and may have masked a positive identification. Benzene showed up in nearly all samples taken including field blanks. This was considered as background interference. Soil vapor analytical results are available in Appendix A.

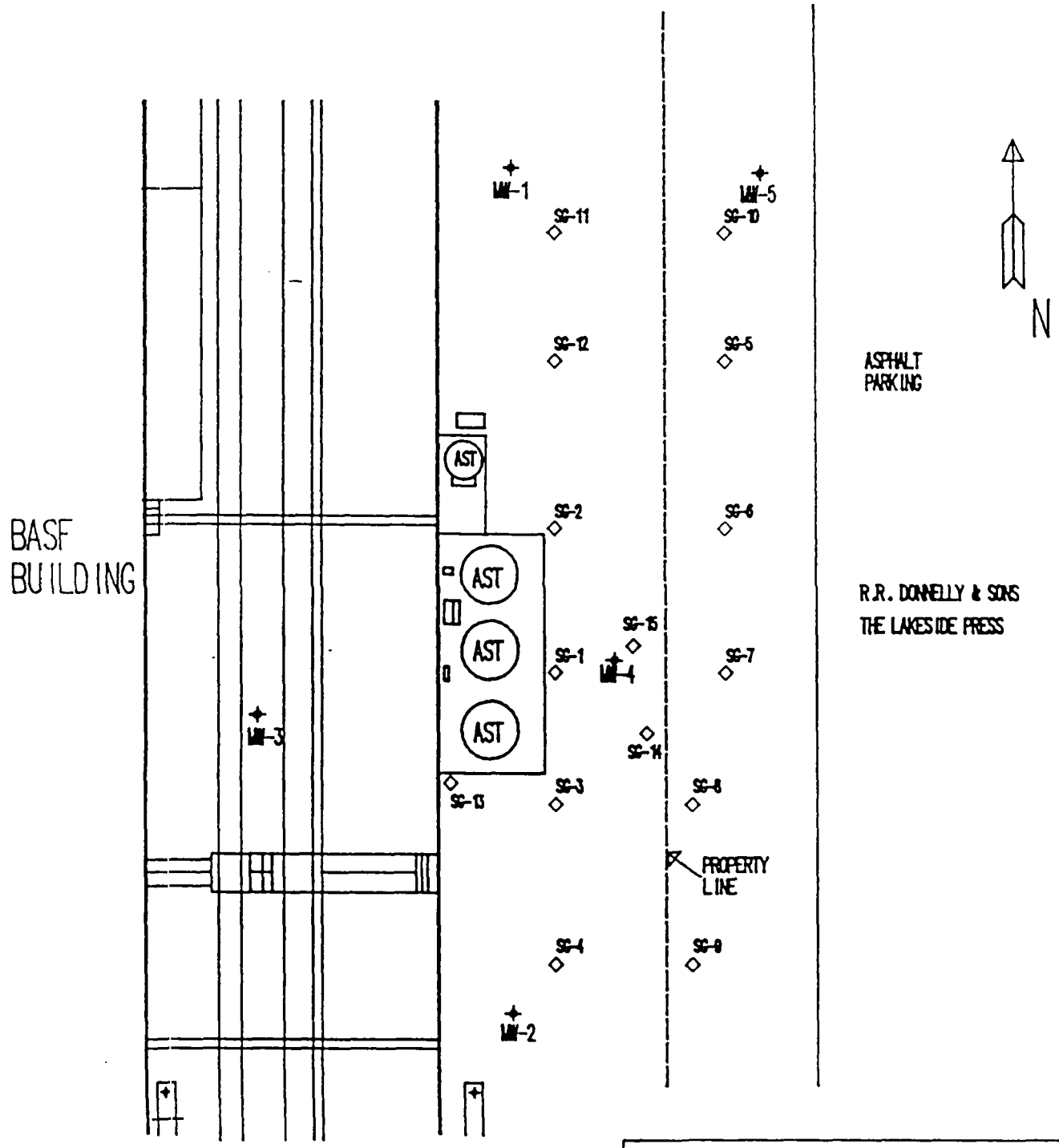
The lack of any volatiles present in the soil pore vapor samples leads to the conclusion that the high water table, combined with recent rainfall, filled pore spaces within the soil matrix with liquid, thereby eliminating head space available for soil vapor accumulation. This rendered the results of soil vapor testing inconclusive at this time.

2.2.2 Aquifer Characterization Results

The aquifer characteristics are described in the following subsections.

2.2.2.1 Ground-water flow

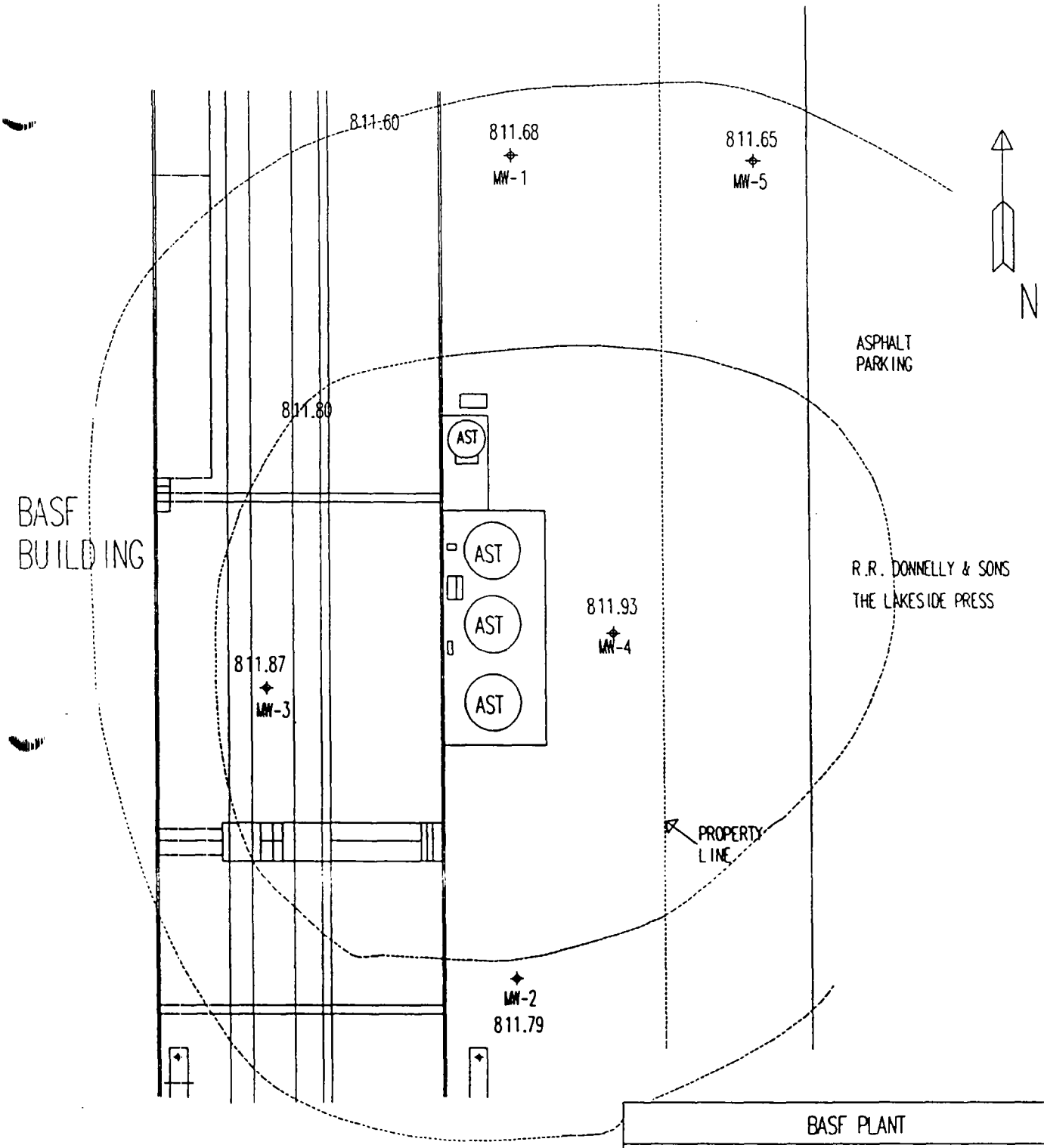
Ground water was encountered at approximately 3 to 4 feet below grade. Table 1 provides a summary of the results of static water level gauging. Figure 4 shows the ground-water contours developed from this data and indicates a radial direction of ground-water flow centered on MW-4. The gradient is approximately 0.003 ft/ft. This is not believed to be the long term flow regime and is more likely to be the result of recent precipitation.



MW-2 MONITOR WELL

◇ SOIL/GAS SAMPLE POINTS

BASF PLANT		
WARSAW, INDIANA		
FIGURE 3 SOIL/GAS SAMPLE LOCATIONS		
HERITAGE REMEDIATION/ENGINEERING, INC. 5656 OPPORTUNITY DRIVE TOLEDO, OHIO 43612		HERITAGE
REVISION: 000	DATE:	DRAWN BY:
SCALE: 1" = 30'	DWG NO.	APPROVED BY:



GROUND-WATER CONTOUR LINE

MW-2 MONITOR WELL

811.79 GROUND WATER ELEVATION IN WELL

BASF PLANT		
WARSAW, INDIANA		
FIGURE 4 - GROUND-WATER CONTOUR MAP		
HERITAGE REMEDIATION/ENGINEERING, INC. 5656 OPPORTUNITY DRIVE TOLEDO, OHIO 43612		HERITAGE
REVISION: 004	DATE: 6-5-91	DRAWN BY: HSW
SCALE: 1" = 30'	DWG NO.	APPROVED BY: RRB

TABLE 1

WATER ELEVATIONS
(Obtained April 2, 1991)

WELL NUMBER	TOP OF CASING (ft)	DEPTH TO WATER (ft)	WATER LEVEL (ft)
MW-1	815.36	3.68	811.68
MW-2	815.63	3.84	811.79
MW-3	815.93	4.06	811.87
MW-4	814.84	2.91	811.93
MW-5	814.95	3.30	811.65

2.2.2.2 Hydraulic conductivity

The hydraulic conductivity of the soils can be calculated from water level data collected during slug/recovery testing using methods developed by Bouwer and Rice (1976) and incorporated into the SLUGIX program distributed by Interprex Limited.

Table 2 provides the results of slug testing of five monitoring wells. The data and resulting graphs are available in Appendix B.

The results of slug testing are a close approximation of true values and generally tend to be somewhat conservative. The results obtained from these tests are consistant with generally accepted values for soils made up of fine to medium grade sands which boring logs indicate are the soil types encountered.

TABLE 2
HYDRAULIC CONDUCTIVITY (K) VALUES

WELL NUMBER	K VALUE (ft/min)	TRANSMISSIVITY (gpd/ft)	TRANSMISSIVITY (ft^2/min)
MW-1	1.77×10^{-2}	4.76×10^{3}	4.42×10^{-1}
MW-2	6.00×10^{-2}	1.62×10^{4}	1.50
MW-3	3.20×10^{-2}	8.63×10^{3}	8.01×10^{-1}
MW-4	2.47×10^{-2}	6.66×10^{3}	6.18×10^{-1}
MW-5	1.36×10^{-3}	3.67×10^{2}	3.41×10^{-2}

2.2.2.3 Ground-water velocity

The ground-water velocity may be estimated by a modification of Darcy's Law and represents the rate at which ground water moves through a water-bearing zone, which is:

$$V = Ki/n$$

where:

V = Ground-water velocity
K = Hydraulic conductivity (from slug tests)
i = Hydraulic gradient (from potentiometric contours)
n = effective porosity (based upon geology)

The velocity of ground-water movement near MW-4 was estimated based upon the hydraulic conductivity (2.47×10^{-2} ft/min) and the gradient of the potentiometric surface. Assuming an effective porosity of 20% for sands and with a hydraulic gradient of about 3.0×10^{-3}, the ground-water velocity was estimated to be about 3.7×10^{-4} ft/min or approximately 5.33×10^{-1} ft/day radially outward from MW-4.

2.2.2.4 *Radius of influence*

A rough estimate of the potential radius of influence can be calculated from the slug test data in combination with a number of assumptions using the following formula:

$$Ro = rw + (Tt/4790*S)^{0.5}$$

where:

Ro = radius of influence (ft)
rw = radius of well
T = transmissivity (gpd/ft)
t = time (min)
S = Storage coefficient (estimate .20)

Calculating the value of Ro using a transmissivity of 6660 gpd/ft, a storage coefficient of 0.20 and assuming a time of one day (1440 min) the radius of influence (Ro) will reach approximately 100 feet. This estimate is undoubtedly higher than that which would actually occur but may be used with an appropriate margin for error to determine adequate well spacing.

2.2.2.5 *Specific capacity*

The specific capacity of a well (gpm/ft of drawdown) can be roughly calculated from values of transmissivity calculated from slug test data using the following formula:

$$Q/s = T/2000$$

where:

Q/s = specific capacity of well (gpm/ft)
Q = pumping rate (gpm)
s = drawdown in the well (ft)
T = transmissivity (gpd/ft)

Solving the equation for storage capacity gives Q/s = 3.33 gpm/ft. Calculating for specific capacity in this manner usually produces optimistic values because the processes of dewatering are ignored.

Therefore 50 to 75 percent of this value should be a realistic value for specific capacity. A pumping rate of 5 to 7 gpm should produce about three feet of drawdown in the pumping well.

2.2.3 Laboratory Analyses Results

Laboratory results indicate no detectable levels of BTEX to the north and south of MW-4. Monitor well MW-3 shows 0.014 ppm of toluene only and monitor well MW-4 contains 56.8 ppm total BTEX, of which 55.9 ppm consists of toluene. Past concentrations of total BTEX concentrations have fluctuated between 26 and 81 ppm and the present level of 56.8 ppm is approximately midway between these values.

Table 3 summarizes the results of analyses of five ground-water samples taken on April 2, 1991. The laboratory report is available in Appendix C.

TABLE 3

ANALYTICAL RESULTS

WELL#	BENZENE	TOLUENE	ETHYLBEN.	o-XYLENE	m+p-XYLENE
MW-1	ND	ND	ND	ND	ND
MW-2	ND	ND	ND	ND	ND
MW-3	ND	0.014	ND	ND	ND
MW-4	0.0182	55.9	0.159	0.106	0.672
MW-5	ND	ND	ND	ND	ND

ND = Not Detected, Detection limit of 0.001 ppm

All results are in mg/L (ppm)

3.0 CONCLUSIONS

The following conclusions can be drawn from the data gathered during this phase of the investigation:

Vadose zone soils are presently saturated and little effective void space exists for the migration of vapors. This is evident by the lack of detectable vapors in the upper two to three feet of soils. Since the majority of soil pore space is occupied by water from surface infiltration or capillary attraction, the soils could be leaching chemical constituents into the ground water.

The ground-water samples revealed no detectable BTEX components in three of the five wells located within the affected area previously identified. This indicates that if the soils are impacted by BTEX the levels are low enough to have little effect on ground water. Monitoring well MW-3 is located in an asphalt covered area of the site and is not subjected to the same flushing and recharge actions as the remaining wells which may explain why this well showed a slightly elevated toluene concentration while the down gradient wells (MW-5 and MW-1) did not.

MW-4 showed exceptionally quick response to changes in water level and may be located in previously disturbed soils which could produce a slight bathtub effect preventing rapid migration away from this area.

Slug test data indicates an average hydraulic conductivity of about 3 X 10^{-2} ft/min which is appropriate for soils of this type. A pumping well located at the present location of MW-4 should influence ground-water flow within the area of concern (approximately 100 foot radius of MW-4) and produce about 5 gpm until the area becomes dewatered. Once dewatering has occurred the rate should fall to less than 5 gpm due to the decrease in saturated thickness resulting in the lowering of transmissivity.

APPENDIX A

PETERSON ENVIRONMENTAL SERVICES
HERITAGE REMEDIATION/B.A.S.F.
SOIL GAS IN PPB

APRIL 2 1991	SG-1	SG-2	SG-3	SG-4	SG-5
BENZENE	(2)	(11)	(11)	(13)	(4)
TOLUENE	<10	<10	<10	<10	<10
TOTAL XYLENES	<10	<10	<10	<10	<10
UNIDENTIFIED PEAKS	4	0	5	0	0

(#'s)= POSSIBLE BACKGROUND INTERFERENCE

PETERSON ENVIRONMENTAL SERVICES
HERITAGE REMEDIATION/B.A.S.F.
SOIL GAS IN PPB

APRIL 2 1991	SG-6	SG-7	SG-8	SG-9	SG-10
BENZENE	(16)	(4)	(4)	(2)	(5)
TOLUENE	<10	<10	<10	<10	<10
TOTAL XYLENES	<10	<10	<10	<10	<10
UNIDENTIFIED PEAKS	0	0	0	0	0

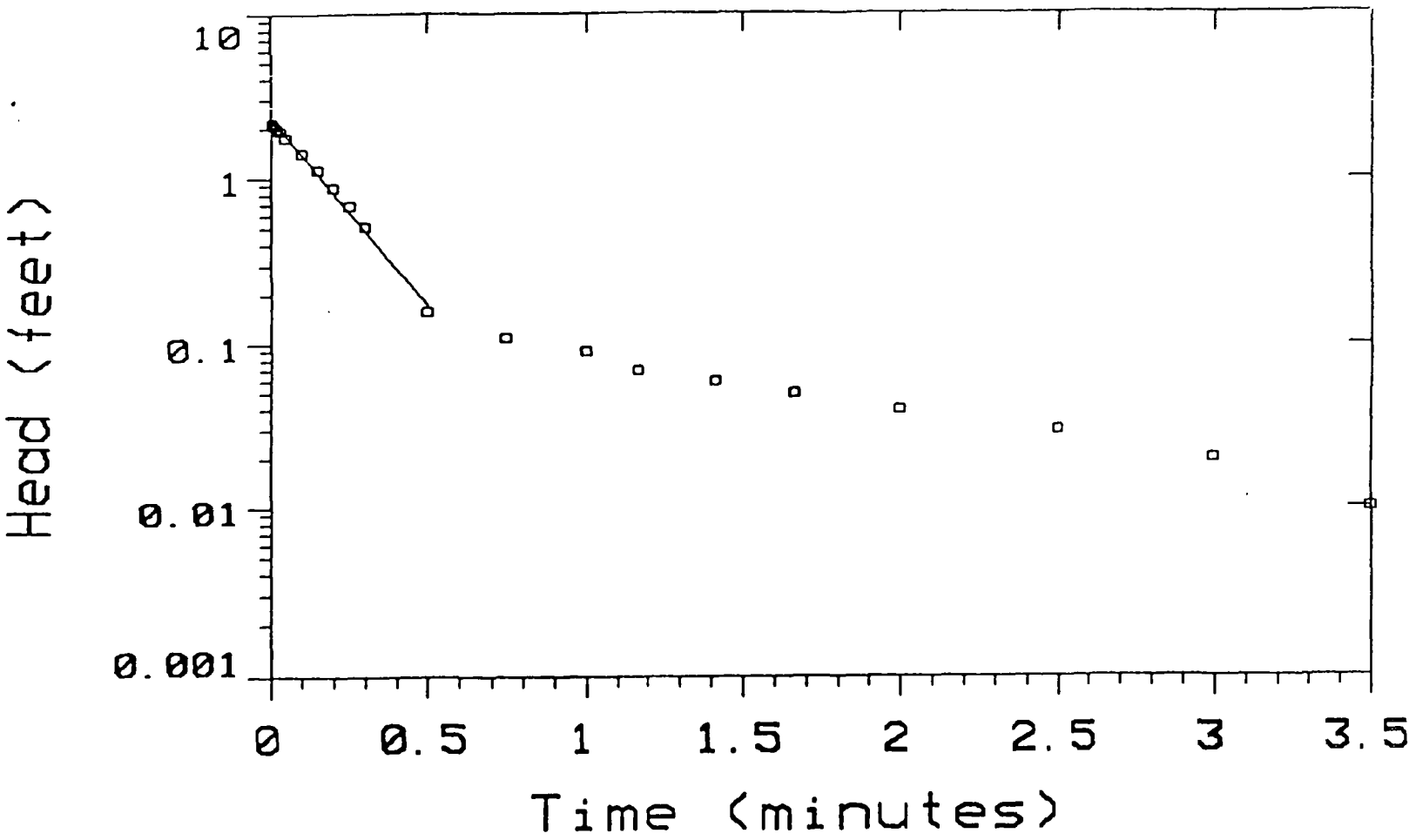
(#'s)= POSSIBLE BACKGROUND INTERFERENCE

PETERSON ENVIRONMENTAL SERVICES
HERITAGE REMEDIATION/B.A.S.F
SOIL GAS IN PPB

APRIL 2 1991	SG-11	SG-12	SG-13	SG-14	SG-15
BENZENE	<10	<10	(3)	(4)	(3)
TOLUENE	<10	<10	<10	<10	<10
TOTAL XYLENES	<10	<10	<10	<10	<10
UNIDENTIFIED PEAKS	0	0	0	0	0

(#'s)= POSSIBLE BACKGROUND INTERFERENCE

APPENDIX B



MODEL TYPE: BOUWER and RICE	for: BASF	Well Slug Test Data
CONDUCTIVITY: .01770 ft/min	by: HERITAGE REMEDIATION/ENGINEERING	
TRANSMISSIVITY: .4425 sq. ft/min	WELL DATA, Units, ft	Well: MW-1
INITIAL HEAD: 2.190 ft	AQUIFER, Endless	WARSAW, INDIANA
Data Set, BASFMW1 / Date: 4/2/91	THICKNESS, 25.00	AQUIFER TESTS
	SCREEN, top, 3.000 base, 13.00	
	DIAMETER, casing, .3200 intake, .3200	
	DEPTH, Water Table, 3.680 TD, 13.00	

DATA SET: BASFMW1

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-1
COUNTY:	AQUIFER TESTS	WELL DEPTH:	13.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	3.680 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	3.000 ft	SCREEN BASE:	13.00 ft
INITIAL HEAD:	2.190 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

TRANSMISSIVITY: 0.44257square ft/min

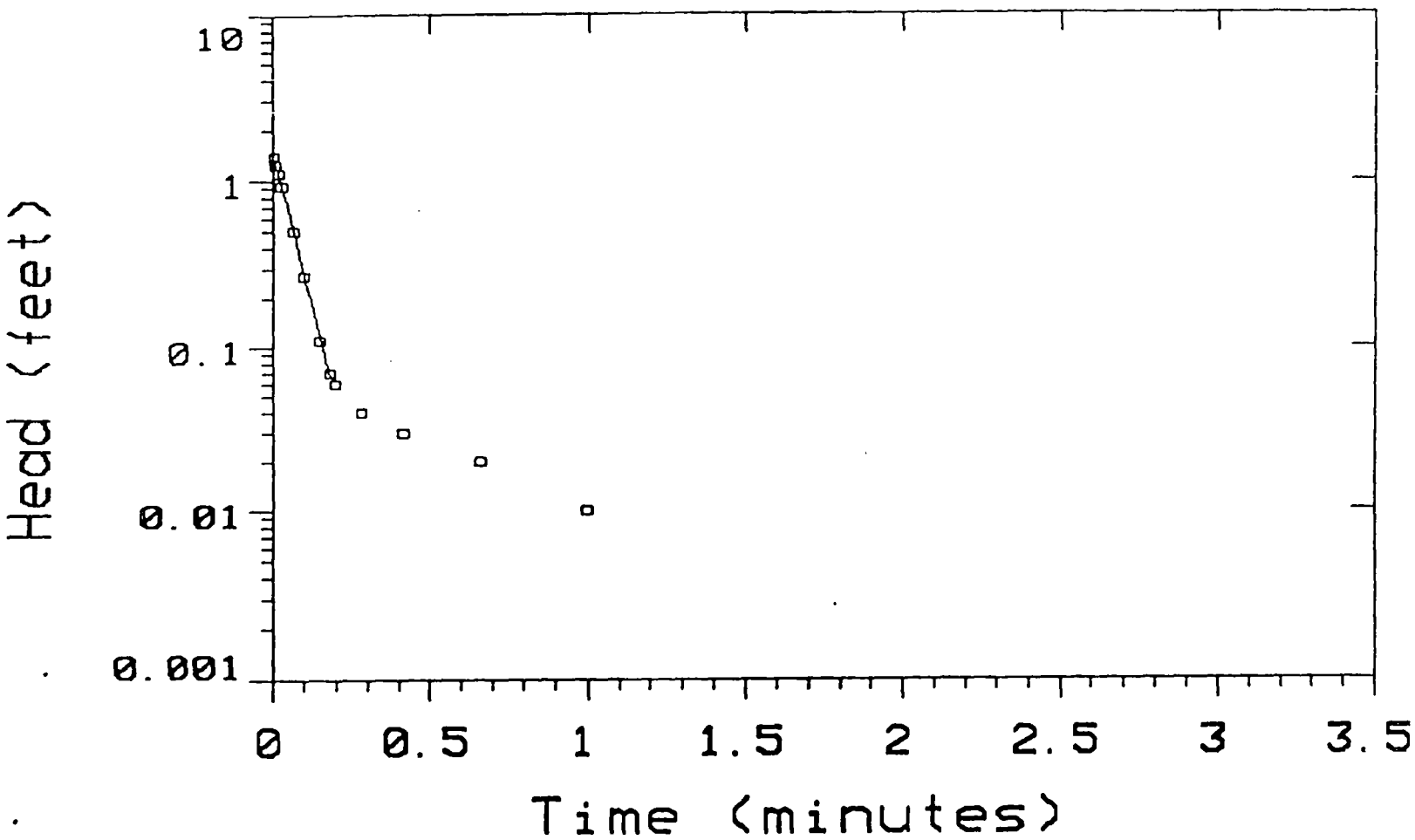
CONDUCTIVITY: 0.01770 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.00330	2.16		
2	0.0100	2.07		
3	0.0167	2.01		
4	0.0267	1.92		
5	0.0467	1.76		
6	0.0967	1.41		
7	0.146	1.12		
8	0.196	0.880		
9	0.246	0.680		
10	0.296	0.510		
11	0.496	0.160		
12	0.746	0.110		
13	0.996	0.0900		
14	1.16	0.0700		
15	1.41	0.0600		
16	1.66	0.0500		
17	1.99	0.0400		
18	2.49	0.0300		
19	2.99	0.0200		
20	3.49	0.0100		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE

* HERITAGE REMEDIATION/ENGINEERING *



MODEL TYPE: BOUWER and RICE	for: BASF	Well Slug Test Data
CONDUCTIVITY: .06003 ft/min	by: HERITAGE REMEDIATION/ENGINEERING	
TRANSMISSIVITY: 1.500 sq. ft/min	WELL DATA. Units. ft	Well: MW-2
INITIAL HEAD: 1.400 ft	AQUIFER. Endless	WARSAW, INDIANA
Data Set. BASFMW2 Date: 4/2/91	THICKNESS. 25.00	AQUIFER TESTS
	SCREEN. top. 3.000 base. 13.00	
	DIAMETER. casing. .3200 intake. .3200	
	DEPTH. Water Table. 3.840 TD. 13.00	

DATA SET: BASFMW2

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-2
COUNTY:	AQUIFER TESTS	WELL DEPTH:	13.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	3.840 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	3.000 ft	SCREEN BASE:	13.00 ft
INITIAL HEAD:	1.480 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

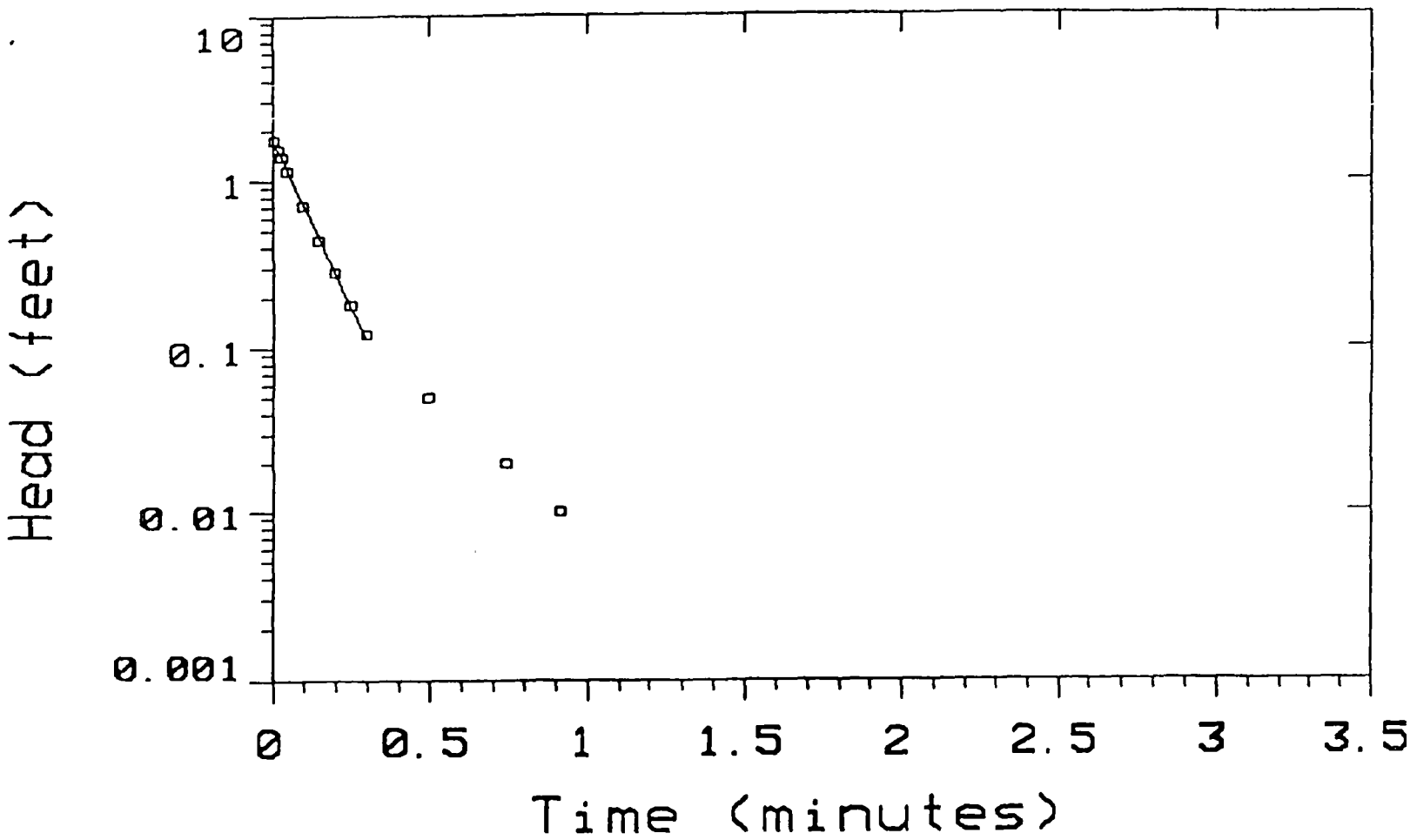
TRANSMISSIVITY: 1.50084square ft/min

CONDUCTIVITY: 0.06003 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.00330	1.39		
2	0.0100	1.24		
3	0.0167	1.10		
4	0.0267	0.930		
5	0.0633	0.500		
6	0.0967	0.270		
7	0.146	0.110		
8	0.180	0.0700		
9	0.196	0.0600		
10	0.280	0.0400		
11	0.413	0.0300		
12	0.663	0.0200		
13	0.996	0.0100		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE



MODEL TYPE: BOUWER and RICE	for: BASF	Well Slug Test Data
CONDUCTIVITY: .03204 ft/min	by: HERITAGE REMEDIATION/ENGINEERING	
TRANSMISSIVITY: .0010 sq. ft/min	WELL DATA, Units: ft	Well: MW-3
INITIAL HEAD: 1.790 ft	AQUIFER, Endless	WARSAW, INDIANA
Data Set: BASFMW3 Date: 4/2/91	THICKNESS, 25.00	AQUIFER TESTS
	SCREEN, top, 3.000 base, 13.00	
	DIAMETER, casing, .3200 intake, .3200	
	DEPTH, Water Table, 4.060 TD, 13.00	

DATA SET: BASFMW3

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-3
COUNTY:	AQUIFER TESTS	WELL DEPTH:	13.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	4.060 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	3.000 ft	SCREEN BASE:	13.00 ft
INITIAL HEAD:	1.790 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

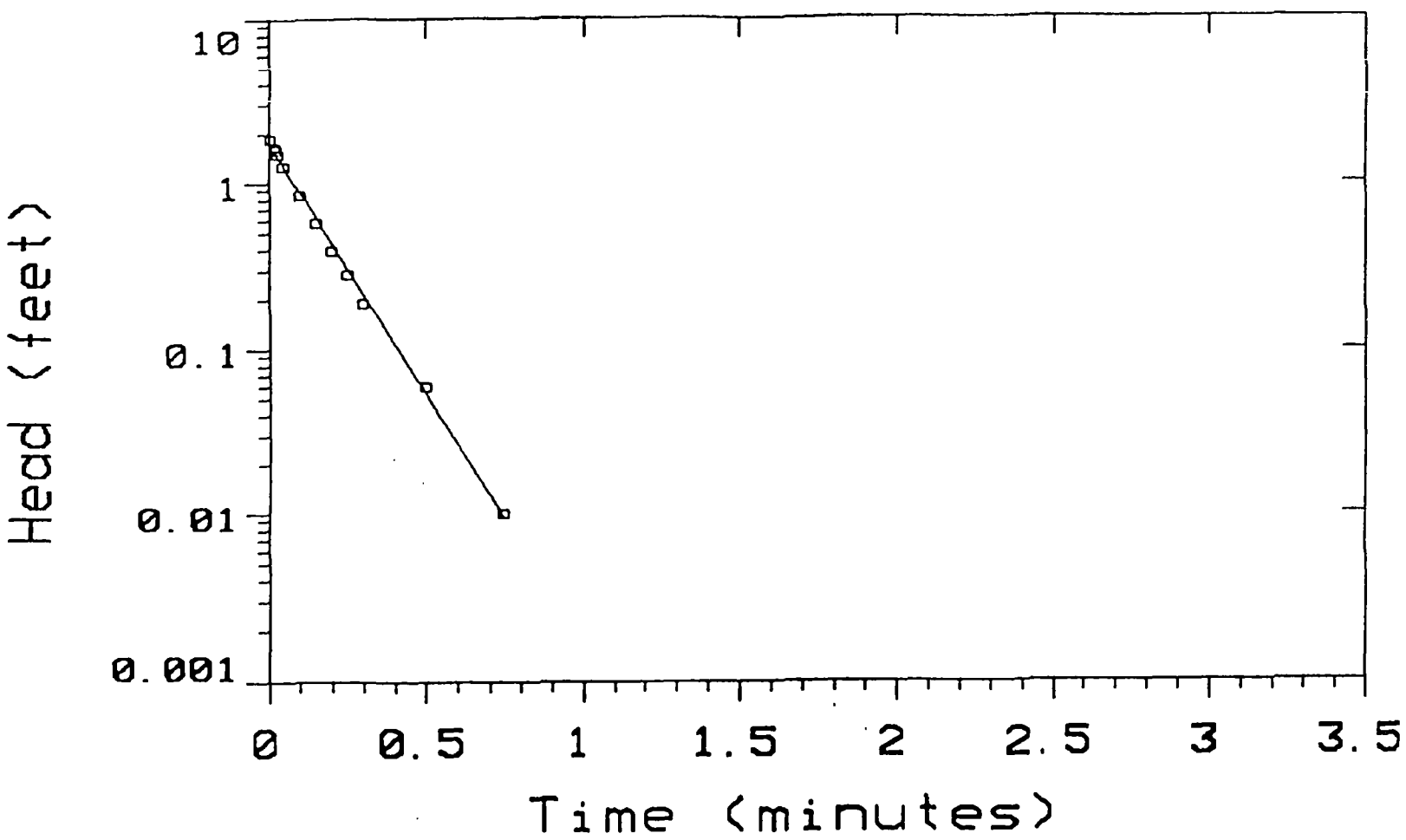
TRANSMISSIVITY: 0.80100square ft/min

CONDUCTIVITY: 0.03204 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.00330	1.74		
2	0.0167	1.53		
3	0.0267	1.39		
4	0.0467	1.15		
5	0.0967	0.710		
6	0.146	0.440		
7	0.196	0.280		
8	0.246	0.180		
9	0.296	0.120		
10	0.496	0.0500		
11	0.746	0.0200		
12	0.913	0.0100		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE



MODEL TYPE: BOUWER and RICE

CONDUCTIVITY: .02470 ft/min

TRANSMISSIVITY: .6176 sq. ft/min

INITIAL HEAD: 1.920 ft

Data Set: BASFMW4 | Date: 4/2/91

for: BASF

by: HERITAGE REMEDIATION/ENGINEERING

WELL DATA. Units. ft

AQUIFER. Endless

THICKNESS. 23.00

SCREEN. top. 2.000 base. 12.00

DIAMETER. casing. .3200 intake. .3200

DEPTH. Water Table. 2.910 TD. 12.00

Well Slug Test Data

Well: MW-4

WARSAW, INDIANA

AQUIFER TESTS

DATA SET: BASFMW4

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-4
COUNTY:	AQUIFER TESTS	WELL DEPTH:	12.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	2.910 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	2.000 ft	SCREEN BASE:	12.00 ft
INITIAL HEAD:	1.920 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

TRANSMISSIVITY: 0.61765square ft/min

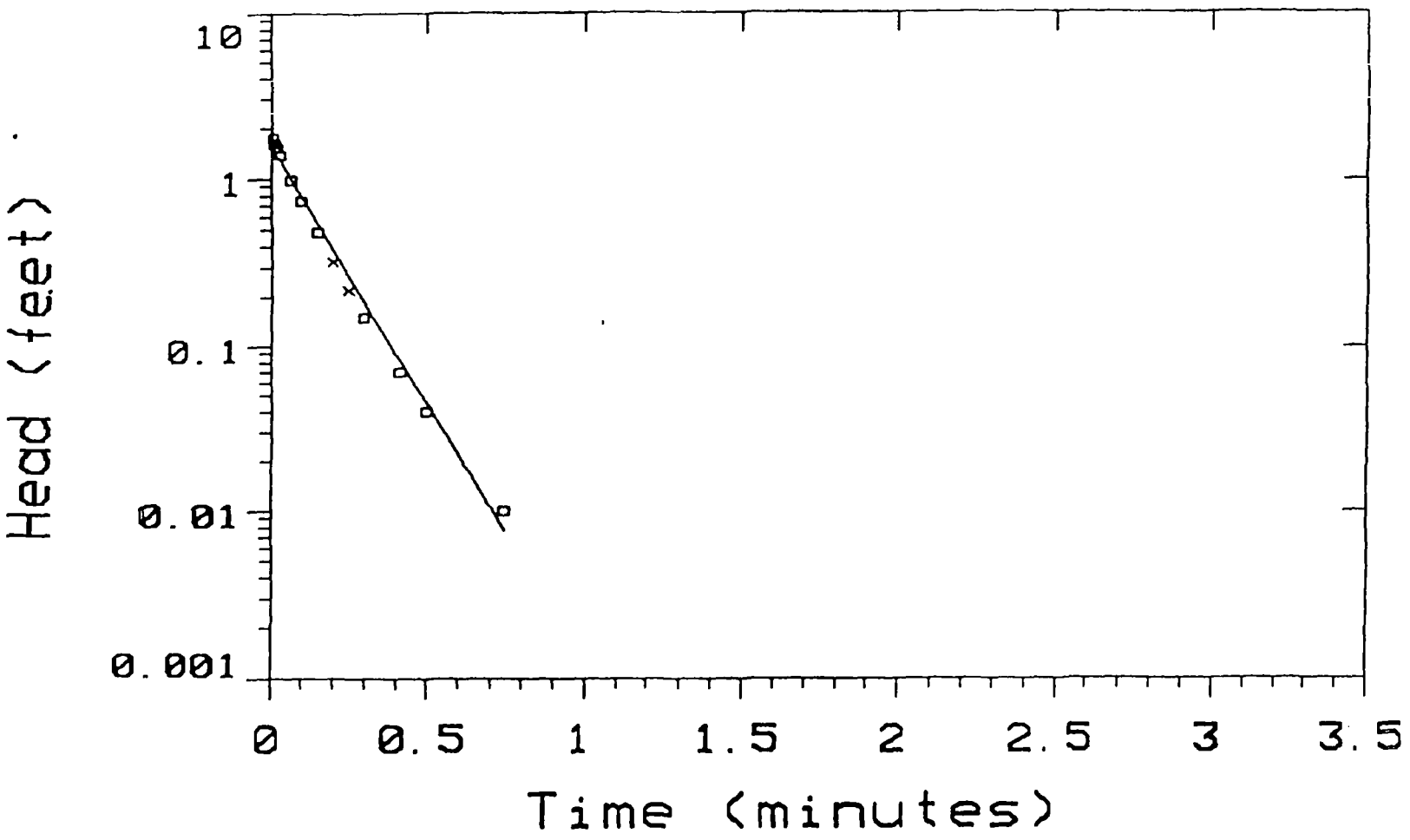
CONDUCTIVITY: 0.02471 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.00330	1.86		
2	0.0167	1.65		
3	0.0200	1.60		
4	0.0267	1.51		
5	0.0467	1.27		
6	0.0967	0.840		
7	0.146	0.570		
8	0.196	0.390		
9	0.246	0.280		
10	0.296	0.190		
11	0.496	0.0600		
12	0.746	0.0100		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE

* HERITAGE REMEDIATION/ENGINEERING *



MODEL TYPE: BOUWER and RICE	for: BASF	Well Slug Test Data
CONDUCTIVITY: .02542 ft/min	by: HERITAGE REMEDIATION/ENGINEERING	Well: MW-4*
TRANSMISSIVITY: .6355 sq. ft/min	WELL DATA. Units. ft	WARSAW, INDIANA
INITIAL HEAD: 1.800 ft	AQUIFER. Endless	AQUIFER TESTS
Data Set. BASFMW42 / Date: 4/2/91	THICKNESS. 23.00	
	SCREEN. top. 2.000 base. 12.00	
	DIAMETER. casing. .3200 intake. .3200	
	DEPTH. Water Table. 2.910 TD. 12.00	

DATA SET: BASFMW42

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-4*
COUNTY:	AQUIFER TESTS	WELL DEPTH:	12.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	2.910 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	2.000 ft	SCREEN BASE:	12.00 ft
INITIAL HEAD:	1.800 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

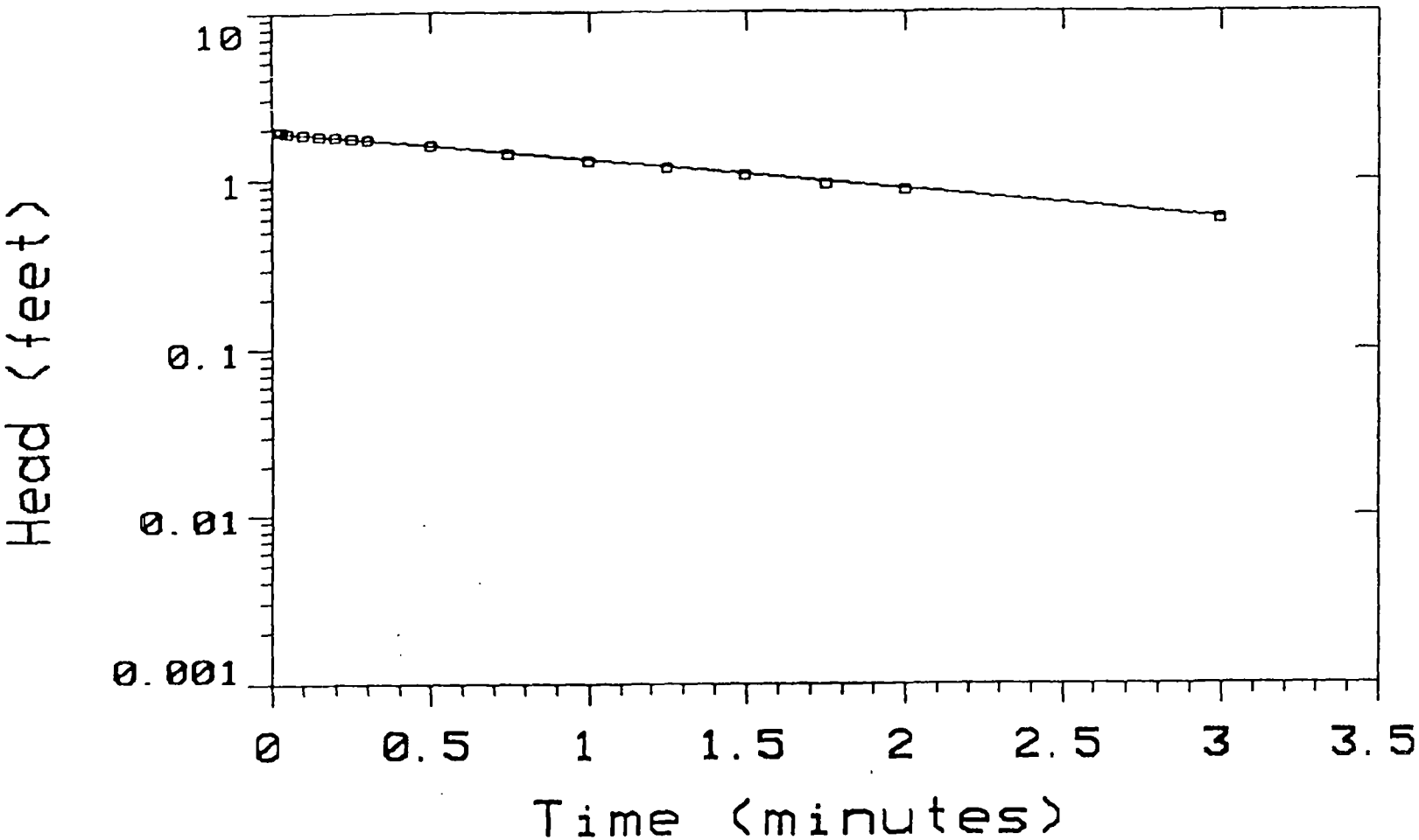
TRANSMISSIVITY: 0.63551square ft/min

CONDUCTIVITY: 0.02542 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.00330	1.73		
2	0.0100	1.62		
3	0.0167	1.52		
4	0.0267	1.38		
5	0.0633	0.980		
6	0.0967	0.730		
7	0.146	0.480		
8	0.296	0.150		
9	0.413	0.0700		
10	0.496	0.0400		
11	0.746	0.0100		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE



MODEL TYPE: BOUWER and RICE	for: BASF	Well Slug Test Data
CONDUCTIVITY: .001363 ft/min	by: HERITAGE REMEDIATION/ENGINEERING	
TRANSMISSIVITY: .03409 sq. ft/min	WELL DATA. Units. ft	Well: MW-5
INITIAL HEAD: 1.940 ft	AQUIFER. Endless	WARSAW, INDIANA
Data Set. BASFMW5 / Date: 4/2/91	THICKNESS. 23.00	AQUIFER TESTS
	SCREEN. top. 3.000 base. 13.00	
	DIAMETER. casing. .3200 intake. .3200	
	DEPTH. Water Table. 3.300 TD. 13.00	

DATA SET: BASFMW5

CLIENT:	BASF	DATE:	4/2/91
LOCATION:	WARSAW, INDIANA	WELL NO.:	MW-5
COUNTY:	AQUIFER TESTS	WELL DEPTH:	13.00 ft
PROJECT:	Well Slug Test Data	WATER TABLE:	3.300 ft
AQUIFER:	Endless	THICKNESS:	25.00 ft
INTAKE RADIUS:	0.160 ft	CASING RADIUS:	0.160 ft
SCREEN TOP:	3.000 ft	SCREEN BASE:	13.00 ft
INITIAL HEAD:	1.940 ft	TRANS. RATIO:	1.0000

MODEL PARAMETERS:

TRANSMISSIVITY: 0.03409square ft/min

CONDUCTIVITY: 0.00136 ft/min

MODEL TYPE: UNCONFINED PARTIALLY PENETRATED AQUIFER (Bouwer & Rice)

No.	TIME (mins)	Head, H (ft) DATA	SYNTHETIC	DIFFERENCE (percent)
1	0.0167	1.92		
2	0.0267	1.91		
3	0.0467	1.90		
4	0.0967	1.85		
5	0.146	1.82		
6	0.196	1.78		
7	0.246	1.74		
8	0.296	1.70		
9	0.496	1.57		
10	0.746	1.41		
11	0.996	1.28		
12	1.24	1.16		
13	1.49	1.05		
14	1.74	0.950		
15	1.99	0.870		
16	2.99	0.590		
17	3.99	0.410		
18	4.99	0.290		
19	5.99	0.210		
20	6.99	0.150		

CURRENT RESOLUTION MATRIIX NOT AVAILABLE

* HERITAGE REMEDIATION/ENGINEERING *

APPENDIX C

JONES & HENRY LABORATORIES, INC. / 2567 TRACY ROAD, NORTHWOOD, OHIO 43619 / (419) 666-0411

April 11, 1991

Heritage Remediation/
Engineering, Inc.
5656 Opportunity Drive
Toledo, Ohio 43612
ATTN: Mr. Bob Beckwith

Dear Mr. Beckwith:

Below are results of analysis of 5 samples received for examination on April 3, 1991:

Sample: HRE Description: MW-1 BASF Warsaw
JHL I.D. AB06109 Client P.O. No. 25303 Client Project No. 310
Collected on: 04/02/91

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: BTX			
BENZENE	ug/L	Not Det	1.0
ETHYLBENZENE	ug/L	Not Det	1.0
TOLUENE	ug/L	Not Det	1.0
o-XYLENE	ug/L	Not Det	1.0
m+p-XYLENE	ug/L	Not Det	1.0

Sample: HRE Description: MW-2 BASF Warsaw
JHL I.D. AB06110 Client P.O. No. 25303 Client Project No. 310
Collected on: 04/02/91

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: BTX			
BENZENE	ug/L	Not Det	1.0
ETHYLBENZENE	ug/L	Not Det	1.0
TOLUENE	ug/L	Not Det	1.0
o-XYLENE	ug/L	Not Det	1.0
m+p-XYLENE	ug/L	Not Det	1.0

APR 12 RECD

Sample: HRE Description: MW-3 BASF Warsaw
JHL I.D. AB06111 Client P.O. No. 25303 Client Project No. 310
Collected on: 04/02/91

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: BTX			
BENZENE	ug/L	Not Det	1.0
ETHYLBENZENE	ug/L	Not Det	1.0
TOLUENE	ug/L	14	1.0
o-XYLENE	ug/L	Not Det	1.0
m+p-XYLENE	ug/L	Not Det	1.0

Sample: HRE Description: MW-4 BASF Warsaw
JHL I.D. AB06112 Client P.O. No. 25303 Client Project No. 310
Collected on: 04/02/91

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: BTX			
BENZENE	ug/L	18.2	1.0
ETHYLBENZENE	ug/L	159	1.0
TOLUENE	ug/L	55900	1.0
o-XYLENE	ug/L	106	1.0
m+p-XYLENE	ug/L	672	1.0

Sample: HRE Description: MW-5 BASF Warsaw
JHL I.D. AB06113 Client P.O. No. 25303 Client Project No. 310
Collected on: 04/02/91

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: BTX			
BENZENE	ug/L	Not Det	1.0
ETHYLBENZENE	ug/L	Not Det	1.0
TOLUENE	ug/L	Not Det	1.0
o-XYLENE	ug/L	Not Det	1.0
m+p-XYLENE	ug/L	Not Det	1.0

Please advise should you have questions concerning these data.

Respectfully submitted,

JONES & HENRY LABORATORIES, INC.

Fred W. Doering

Fred W. Doering
President

Ref 8

TELEPHONE CALL REPORT

Date: June 30, 1994
Time: 2:00 p.m.
From: Mary Beth Schmucker
To: Loy Stover, BASF Corp., Warsaw, IN
219-269-4603
Subject: Details of cleanup performed at BASF Corp (contamination reported to IDEM Emergency Response as Incident No. 8911139) and current status

Summary: Mr. Stover relayed what he could remember about the cleanup action taken to address BTEX (particularly toluene) contamination in the soil and groundwater near the above ground storage tanks. Reported that BASF had installed and operated an air stripper to address groundwater; did not recall that they took any samples to verify condition of the groundwater prior to removing system. BASF has removed or capped all of the monitoring wells from the investigation and has built a new storage tank pad in the (formerly?) contaminated area.

Action Required: Fax map from investigation report to Mr. Stover to verify site location.

Details: BASF sent a letter dated August 19, 1991 to Dorel Hunt, IDEM, which outlined the work planned to address the contamination reported to IDEM on November 30, 1989. The letter requested approval from IDEM. Mr. Stover stated that Dorel Hunt indicated that the site was fairly minor and that they should proceed with the cleanup, but IDEM would not review and approve the plan or oversee the work. BASF proceeded with the plan in the letter, using the most contaminated monitoring well, MW-4, as the extraction well. BASF built an air stripper, and the pumped groundwater was circulated through the stripper and then discharged back to the ground. BASF, rather than a consultant, basically ran the system.

Mr. Stover stated that they ran the system for several months, but couldn't recall how long or when they removed it. Although the August 19 letter included a sampling schedule for monitoring the effectiveness of the system, Mr. Stover did not think that any groundwater or soil sampling had been performed which would verify the effectiveness of the cleanup.

Since that time, BASF has built a new above ground tank farm over part of the formerly contaminated area. To install the concrete pad, soil was dug out to a depth of about 6 feet. The workers could smell small traces of toluene, but they dissipated quickly. Monitoring equipment showed toluene below the threshold limit. The results of this monitoring may be available; he would check with the industrial hygienist.

Mr. Stover was not entirely sure about the source of the contamination. He believes that when BASF had the tanks painted in the 1980s by college-age painters, they would wash their brushes in a bucket and throw the water on the ground. He thinks that the toluene came from the paint. The tanks located adjacent

to the contaminated area contain toluene, but these were ruled out as a source because no evidence of leaks was observed. Another theory was that the process vents attached to the BASF building, which discharged process solvent used inside the plant as a vapor, may have also expelled liquid organics which contaminated the soil. In late 1989, this procedure was discontinued. This has been ruled out as a source because there was no evidence of contamination in open containment areas (?) near the building.

I tried to find out if the figures in the ATEC investigation reports showing the location of the project site were accurate, however, this proved to be very difficult over the phone. I asked Mr. Stover if I could fax him the map so that he could indicate the site location, and he agreed. Mr. Stover also stated that he was no longer the plant manager, and he had turned over most of the files dealing with this situation to the new plant manager, Mike Herring. Mike Herring was not with BASF during the time that the investigations and cleanups were taking place.

BASF Corporation

BASF Ref 9

August 19, 1991

Engineering & Ecology

Dorel Hunt
Indiana Department of Environmental Management
5500 West Bradbury Ave.
Indianapolis, IN 46241

Re: BASF - Warsaw, IN Facility
Proposed Remedial Action

Dear Mr. Hunt:

Enclosed is a Site Assessment report for the above-referenced facility. As you are aware, BASF has been performing an investigation to determine the extent of benzene, toluene, ethylbenzene, and xylene (BTEX) in the soil and ground water adjacent to above-ground storage tanks at the site.

The investigations determined that a circular area approximately 200 feet in diameter around MW-4 has been impacted with BTEX. The most recent ground water sampling indicated concentrations of BTEX at 56.8 parts per million in MW-4 and 14 parts per billion in MW-3. BTEX was not detected in the remaining wells. Based on this and other information, BASF proposes the following remedial action for the site:

1. Extraction of groundwater from the impacted area at approximately 5 gpm, using MW-4 as the extraction well;

2. Treatment of groundwater through a granular activated carbon system operating in series;

3. Discharge of treated groundwater back to the ground through surface application.

The system will operate for approximately four months, (until the ground freezes). In the spring, the monitoring wells will be resampled, and if the sampling indicates that the remediation system should continue, it will be reactivated.

The following sampling schedule will be followed during the operation of the system:

1. Immediately prior to system activation, MW-3 and MW-4 will be sampled;

2. A round of sampling from all five wells will be taken one month following system startup and just prior to system shut down;

c Campus Drive. Parsippany, New Jersey 07054 (201) 397-2700 Telefax (201) 397-2737

3. Soil samples will be taken following one month of operation. Samples will be taken from four locations as shown in Figure 1 (attached). Two samples will be taken at each location at 3-4 feet and 5-6 feet below grade. Soil samples will be taken again just prior to system shut down;

4. Water samples will be taken weekly for the first month of operation and then again just prior to system shut down from three locations: the influent to the carbon treatment system, between carbon canisters, and from the effluent;

5. Ground water levels will be recorded twice daily during system installation and for 24 hours following start-up. Water levels will be measured weekly for one month and then monthly thereafter.

BASF is requesting approval of this remediation system from IDEM. We will be happy to meet with you to discuss this matter in more detail if you would like.

Please contact me if you have any questions or comments on this system.

Sincerely,

Patricia L. Wells

Patricia L. Wells
Senior Specialist
Site Remediation

cc: L. Stover, BASF

Rev'd 8/2/94

Ref 10

BASF Corporation

BASF

Date: 7/26/94

Mary Beth Schmucker
Office of Environmental Response
Site Investigation
Indiana Dept. Environmental Mgt.
100 N. Senate Avenue
P.O.Box 6015
Indianapolis, IN 46206-6015

RE: BASF Corporation-Warsaw,IN
ATEC Project # 21-97671
Heritage Remediation/Eng.
Proposal #910509, SI #T181
IDEM Incident # 8911139

The following is a reconstruction of the BASF Corp. Warsaw,IN Plant-IDEM incident # 8911139 as I committed to you after our June 30th telephone conversation.

During the very dry 1988 year the dike pad for the three (3), toluene storage tanks (17K gals. each) settled about 3". In December of 1989, the BASF Warsaw Plant had SGA, Inc. investigate the foundation soil conditions**(a)** in the area South of the three, diked solvent storage tanks.

SGA studied the geology of the concrete dike areas, read the Kosciusko Co. soil survey, and made three soil borings 7.5 to 20ft. deep. A hydrocarbon odor was noticed in Boring 1 from 3.1 to 6.5 feet. SGA's investigations were limited to the building foundation support issues.

BASF Ecology Coordinator L.Stover **(b)** notified IDEM (Dorel Hunt), and was informed that the case was given #8911139, with Federal Incident #21379 from the NRC. Appropriate contacts within BASF and property owner R.R.Donnelley were also made.

BASF then contracted ATEC Environmental Consultants, Indianapolis, IN. to investigate for toluene subsurface soil contamination **(c)**. ATEC installed three (3) monitoring wells each about 10 feet in depth **(d1)**. January 31, 1990, the wells were sampled and tested for toluene. All three samples showed less than 5 ug/L toluene concentration, with a 5 ug/L quanitation limit. ATEC also analyzed eight (8) soil borings for purgeable organics **(d2)**. This investigation identified the approximate horizontal limits of any contamination, although site characterization was incomplete.

On March 2, 1990, L.Stover **(e)** updated Mr. Dorel Hunt (IDEM) and filled out an IDEM narrative spill report **(f)**. BASF was asked to address future IDEM responses to Mr. Dorel Hunt. BASF clarified that this was not a spill, but a detection of possible ground contamination while doing a soil compaction test.

Old Road 30, West, Warsaw, Indiana 46580
Mailing Address: P.O. Box 287, Warsaw, Indiana 46580 (219) 269-4603

Between 3/90 and 12/90 BASF evaluated several Remediation proposals under the direction of Patricia Wells, BASF Senior Specialist, Site Remediation.

Heritage Remediation/Engineering was selected **(j)** to begin 2/20/91 Aquifer pumping tests on five (5) monitoring wells. Four (4) wells: **MW-1,-2,-3,-5** resulted in all BTEX <0.005 ppm which was below the detection limit. **MW-4** was near the center of the impacted groundwater plume and indicated 26 ppm toluene**(k)**. Indiana State Drinking Water Act stated that the Maximum Contaminant Level (MCL) for toluene is 2.0 ppm.

HR/E, Inc. concluded **(k)** that the toluene concentration in the vicinity of MW-4 would become more diluted as cleaner ground water approached from the outer limits of the cone of depression. Toluene concentration was expected to decrease to nondetectable without further remediation efforts.

This conclusion notwithstanding, BASF pursued an evaluation of alternatives to shorten the time frame to complete any remediation. The result of the evaluation was the alternative "Proposed Remedial Action Plan"**(n)** that Patricia Wells apparently mailed to Mr. Dorel Hunt of IDEM. BASF's files contain no correspondence beyond this document.

The following partial summary **(o)** was obtained from BASF records on the Warsaw project. On 8/16/91, a proposal to pump and treat groundwater was discussed with Dorel Hunt of IDEM. The groundwater would be treated with carbon and reinfiltrated into the ground. Mr. Hunt said they did not have the personnel to handle this low priority site; therefore, any work we performed would be voluntary. He also stated that IDEM would not approve or disapprove our proposal. However, he agreed to check that infiltration would be allowed without a permit. About 26 ppm of BETX (toluene) was detected in one well and 15 ppb in another. All others were clean.

On 9/12/91 another note was entered into the internal project database stating: Air Sparging unit installed on one well to aid in air stripping groundwater.

M.Herring checked with Mike Raymer of the BASF Warsaw Maintenance Department on 7/26/94 as to the extent of air sparging that he was aware of. M.Raymer assured me that the MW-4 was constantly air stripped from August, 1991 until about August, 1993. John Byrnes of BASF's Remediation Group had supplied the Warsaw Plant with a well water level meter for the air stripping project. Mike Raymer said some observations from well stripping indicated positive lowering of purgeable for about two months. After that time there was never any positive evidence of VOC's being stripped from the well. There was no file or knowledge of any samples or data recorded.

In the 4th quarter of 1993 the construction of the new resinate dike was being planned. The air stripper and level meter were removed, and the meter returned. No further samples were taken, and no final report was issued on the air sparging.

In October of 1993 construction began on a concrete dike and foundation system to support two new resinate storage tanks. This new construction was in the area South of the three existing toluene storage tanks. The soil removal included the excavating and removal of MW-4 and MW-2.

There was an initial, slight toluene odor in this area when digging began. Warsaw Maintenance used the portable VOC meter and by the time the meter was stabilized, there was no VOC detectable. After the initial approx. 5 cu.yds. of dirt was turned over and removed, the slight VOC odor was no longer observed. After the total soil removal job was completed, an estimated 400 cu.yds. of dirt was removed from the old MW-4 and MW-2 area for the resinate storage tank dike installation. This dirt was clean, free of any toluene odor, and there was no measurable VOC in the clean soil as measured by a ppm sensitive Gas Tech meter.

The estimated 400 cubic yards of clean soil removal was completed 10/93 by Robinson Construction of Warsaw, IN. Robinson removed soil volume (75 ft.South x 30 ft. East x 5 ft. deep) as shown in the attached ATEC drawing # 21-97671. Robinson reported reusing the clean dirt to backfill and relandscape around the outside of the dike wall.

The Warsaw Plant was contacted 6/30/94 by phone and Fax **(q)** from IDEM's Mary Beth Schmucker wanting any history of remedial action/ closure that we may have.

The Warsaw Plant made the practical determination that there was no remaining ground contamination of toluene in the area as confirmed by the soil removal in October, 1993**(r)**. This summary was relayed to Mary Beth Schmucker of IDEM in a phone conversation on 7/26/94.

In summary, the investigations identified relatively low levels of contamination, and the approximate vertical and horizontal extent was defined. Although no action was necessarily required, BASF operated a remediation system for approximately two years. Based on the observations during construction in the remediation area, the remediation effectively reduced the toluene in the soil and groundwater. BASF plans no further action for the area and considers the project closed.

W.M. Herring
W.M. Herring
BASF-Warsaw Plant
Manager & Site
Ecology Coordinator

cc: Dale Webster(BASF)
Bob Kruse(BASF)

References in Warsaw Plant IDEM Incident #8911139 File.

(a) Shilts,Graves & Associates,Inc.(SGA), Soil Investigation Tank Settlement BASF Plant Warsaw, IN., L.D.Graves,P.E. to Harry Hart(BASF), 1289-40912, 7 Dec. 1989,

(b) BASF: Check Soil For Compaction and Detected Toluene 5 ft. South of Solvent Tank Farm Wall, L.Stover to L.Krise (BASF), December 1, 1989.

(c) ATEC Environmental Consultants, Subsurface Investigation Toluene Spill -BASF Plant, Warsaw, IN., ATEC Proposal # PE-89970, L.E.Kahrs and M.R.James (ATEC) to L.Stover(BASF), December 21, 1989.

(d) ATEC: Three Water Benzene, Ethylbenzene, Toluene, Xylene(BETX) U.S. EPA Method 624-BASF Corp., ATEC Project # 21-97671, K.S.Kline (ATEC/Testing Div.) to K.Kading (ATEC,Inc.), 2/8/90.

ATEC: Eight Soil BTEX, SW 846 Method 8240-BASF Corp., ATEC Project # 21-97671, Ibid, 2/2/90.

ATEC: Summary-Subsurface Investigations, K.W.Kading and L.E.Kahrs, 4/5/90.

(e) BASF Report to IDEM on Spill Narrative, IDEM Incident #8911139, L.Stover (BASF) to Dorel Hunt (IDEM), March 2, 1990.

(f) IDEM Form Re: Release of Toluene Blend near westside of Tank Farm, R.L.Moran, Chief ER Section, IDEM, December 6, 1989.

(g) BASF: Comments on ATEC's 2/27/90 Report Titled "^Subsurface Investigation", Patricia Wells (BASF Site Remediation Sr. Specialist) to K.Kading ATEC, March 19, 1990.

(h) BASF Faxed Information IDEM : Key To Drawing on Monitor Wells Location, L.Stover to D.Hunt (IDEM), March 23, 1990.

(i) BASF: Meeting Summary-12/18/90 to Review Remediation Proposals, P.Wells to L.Stover, January 2, 1991.

(j) Heritage Remediation/Engineering, Inc.(HR/E,Inc.), RE: Site Remediation Proposal #910509, SI #T181, January 21, 1991, BASF PO# 810408 issued 2/20/91 for two weeks work to begin.

(k) HR/E,Inc., RE: Aquifer Pumping Test-BASF Facility, Warsaw, IN., R.R.Beckwith (HR/E) to L.Stover (BASF), March, 15, 1991.

(l) BASF: Draft Corrective Action Plan, Pat Wells to K.D.Wherley (HR/E,Inc.), May 29, 1991.

(m) HR/E,Inc. RE: Recommendations for Corrective Action Including Cost Estimate of $44,500., K.D.Wherley and R.R.Beckwith(HR/E) to Pat Wells (BASF), June 10 1991.

(n) BASF: RE Proposed Remedial Action Plan, Pat Wells (BASF) to Dorel Hunt (IDEM), August 19, 1991.

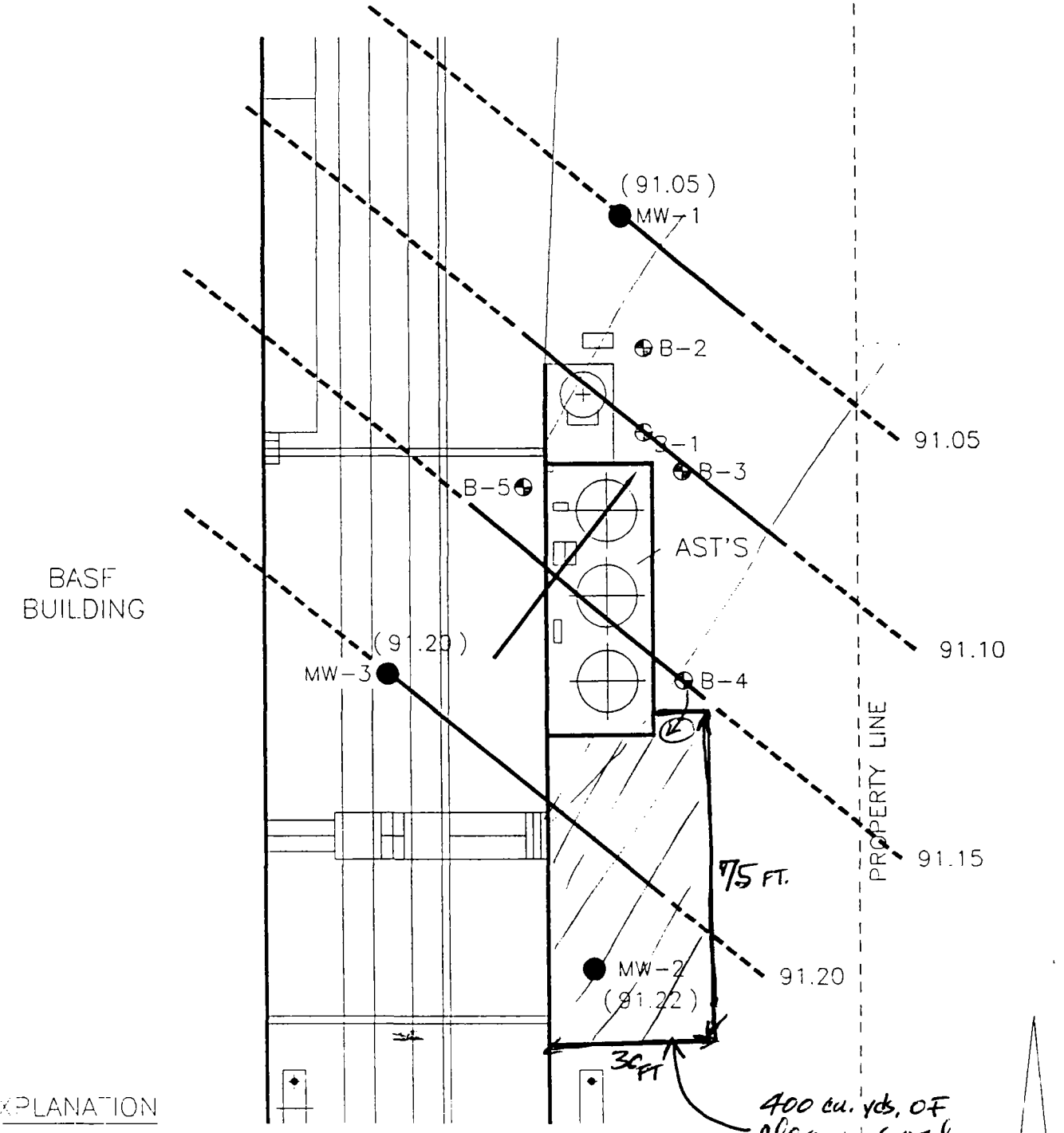
(o) BASF: Project Management System Notes, Dale Webster (BASF), for 8/16/91 and 9/12/91 summary of the Warsaw Remediation Project.

(p) Warsaw has no other reports, communication, knowledge, etc. in our files beyond the above 9/12/91 database notes.

(q) Warsaw was contacted June 30, 1994, by Mary Beth Schmucker of IDEM. Her Fax#: (317) 233-6358 and phone #(317) 233-6783. She wanted an aerial photo if available on the site and any information on history of the remediation result/closure that we could provide. M.Herring faxed her (7/1/94) a topo map and an RRD aerial photo showing the BASF Plant in relation to RRD. On 7/1/94, I faxed Dale Webster asking for assistance to summarize the BASF Remediation for submittal to IDEM by July 30, 1994, if possible.

(r) M.Herring contacted 7/26/94 by Mary Beth Schmucker of IDEM and related the above history. I recommended closing out the project based on the est. 400 cu.yds. clean dirt removal and no indications of further toluene contamination problem. The report was promised by the end of July, and she seemed satified with the conclusions and recommendation.

7/8

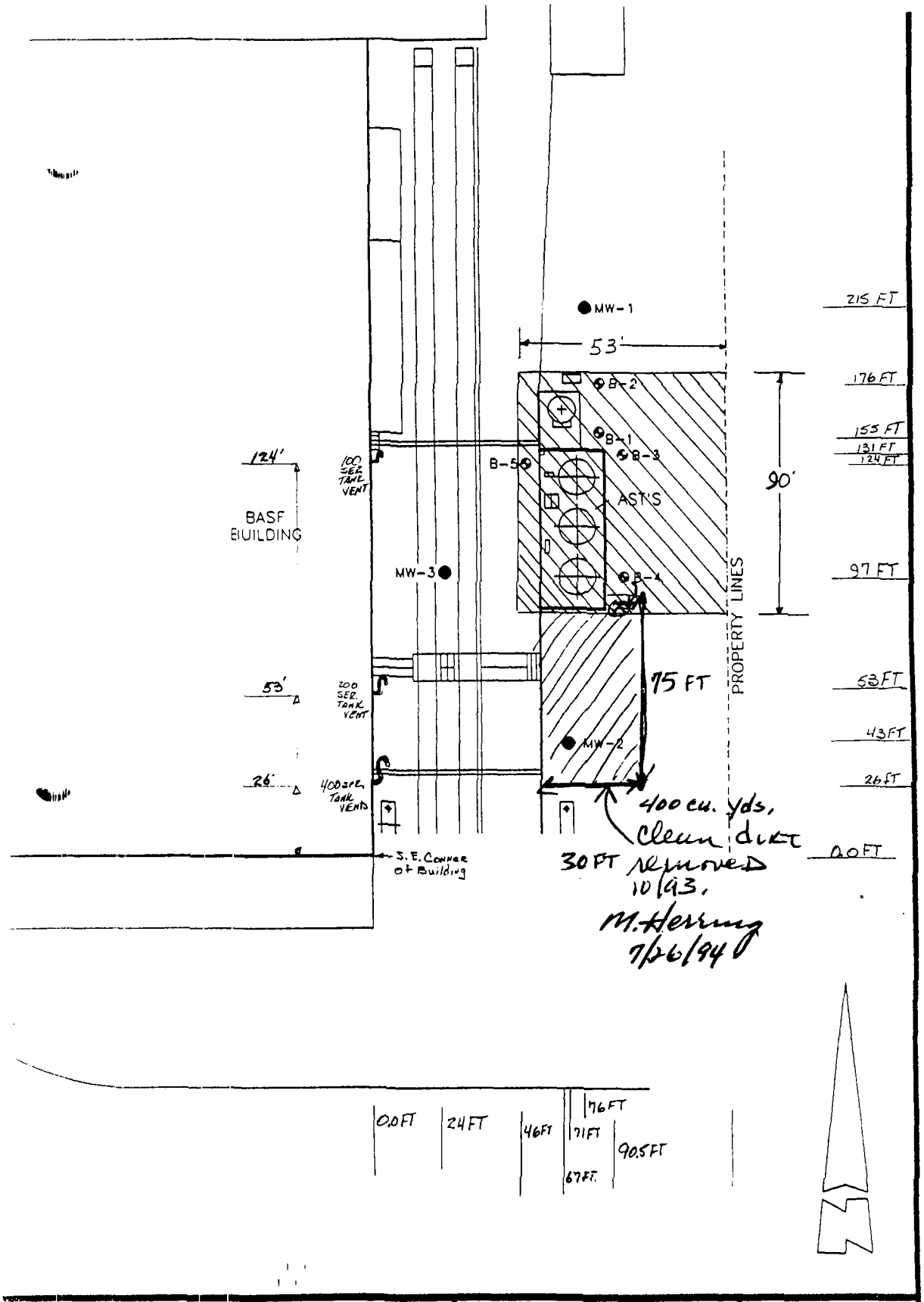


WATER TABLE ELEVATION MAP - 31 JAN 90
SUBSURFACE INVESTIGATION
BASF PLANT
WARSAW, IN

PROJECT NO.	21-97671
SCALE	NONE
FIGURE NO.	5

ATEC

8/8



PROJECT NO.	21-97671
SCALE	NONE
FIGURE NO.	2

ATEC

C

OMB Approval Number: 2050-0095
Approved for Use Through: 4/95

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: IN	CERCLIS Number: IND026735506
	CERCLIS Discovery Date: 01/25/90	

1. General Site Information

Name:		Street Address:			
B.A.S.F. Corporation		Old U.S. 30 West			
City:	**State:**	**Zip Code:**	**County:**	**Co. Code:**	**Cong. Dist:**
Warsaw	IN	46580	Kosciusko	85	02
Latitude:	**Longitude:**	**Approx. Area of Site:**		**Status of Site:**	
41° 14' 37.0"	85° 54' 4.0"	27 sq feet		Active	

2. Owner/Operator Information

Owner:			Operator:		
R.R. Donnelly & Sons Company			B.A.S.F. Corporation		
Street Address:			**Street Address:**		
P.O. Box 837			Old U.S. 30 West		
City:			**City:**		
Warsaw			Warsaw		
State:	**Zip Code:**	**Telephone:**	**State:**	**Zip Code:**	**Telephone:**
In	46580	219-267-9460	IN	46580	219-269-4603
Type of Ownership:			**How Initially Identified:**		
Private			Incidental		

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: IN	CERCLIS Number: IND026735506
	CERCLIS Discovery Date: 01/25/90	

5. General Site Characteristics

Predominant Land Uses Within 1 Mile of Site:	Site Setting:	Years of Operation:
Industrial	Rural	Beginning Year: 0 Ending Year: 0

Type of Site Operations:
Manufacturing
Industrial Organic Chemicals
Miscellaneous Chemical Products

Waste Generated:
Onsite

Waste Deposition Authorized By: Present Owner

Waste Accessible to the Public
Yes

Distance to Nearest Dwelling, School, or Workplace:
10 Feet

6. Waste Characteristics Information

Source Type	Quantity	Tier
Contaminated soil	2.70e+01 sq ft	A

General Types of Waste:
Organics
Paints/Pigments

Physical State of Waste as Deposited
Liquid

Tier Legend
C = Constituent W = Wastestream
V = Volume A = Area

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7. Ground Water Pathway

Is Ground Water Used for Drinking Water Within 4 Miles: No	Is There a Suspected Release to Ground Water: No	List Secondary Target Population Served by Ground Water Withdrawn From:
Type of Ground Water Wells Within 4 Miles: Municipal Private	Have Primary Target Drinking Water Wells Been Identified: No	0 - 1/4 Mile 0 >1/4 - 1/2 Mile 0 >1/2 - 1 Mile 0 >1 - 2 Miles 0 >2 - 3 Miles 0 >3 - 4 Miles 0 Total 0
Depth to Shallowest Aquifer: 0 Feet Karst Terrain/Aquifer Present: No	Nearest Designated Wellhead Protection Area: None within 4 Miles	

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8. Surface Water Pathway — Part 1 of 4

Type of Surface Water Draining Site and 15 Miles Downstream:	Shortest Overland Distance From Any Source to Surface Water:
Lake	0 Feet 0.0 Miles
Is there a Suspected Release to Surface Water: No	Site is Located in: Annual - 10 yr floodplain

8. Surface Water Pathway — Part 2 of 4

Drinking Water Intakes Along the Surface Water Migration Path: No

Have Primary Target Drinking Water Intakes Been Identified: No

Secondary Target Drinking Water Intakes:
None

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8. Surface Water Pathway — Part 3 of 4

Fisheries Located Along the Surface Water Migration Path: No

Have Primary Target Fisheries Been Identified: No

Secondary Target Fisheries:
None

8. Surface Water Pathway — Part 4 of 4

Wetlands Located Along the Surface Water Migration Path? (y/n) Yes

Have Primary Target Wetlands Been Identified? (y/n) No

Secondary Target Wetlands:
None

Other Sensitive Environments Along the Surface Water Migration Path: No

Have Primary Target Sensitive Environments Been Identified: No

Secondary Target Sensitive Environments:
None

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
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	CERCLIS Discovery Date: 01/25/90	

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination: No	Number of Workers Onsite: None

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination: No

10. Air Pathway

Total Population on or Within:	
Onsite	0
0 - 1/4 Mile	0
>1/4 - 1/2 Mile	0
>1/2 - 1 Mile	0
>1 - 2 Miles	0
>2 - 3 Miles	0
>3 - 4 Miles	0
Total	0

Is There a Suspected Release to Air: Yes

Wetlands Located Within 4 Miles of the Site: No

Other Sensitive Environments Located Within 4 Miles of the Site: No

Sensitive Environments Within 1/2 Mile of the Site:
None

4 - Mile Radius Map
BASF Site, Warsaw, IN

15 -Mile Surface Water Pathway
BASF Site, Warsaw, IN